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THE PRACTICAL TEACHER

THE LATE PROFESSOR MEIKLEJOHN.

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EDUCATION IN PARLIAMENT—APRIL.

TWELVE months after the Cockerton Judgment comes the Education Bill of 1902. Such is the result of maleficent meddling with the wheels of progress by fanatics and obscurantists. They have overreached themselves. They set out to hinder education both in its abstract idea and its School Board form; what they produced was two Bills and one Act of Parliament, all about education. The Cockerton Committee tried to shoe the wheel, but only gave it a push. Methinks there are nowhere to-day a set of more discomfited and ridiculed persons than the members of the Cockerton Committee. They went out for wool and came back shorn.

The Education Bill now before Parliament would never have seen the light, I think, had it not been for the activities of the Cockerton Committee. Out of evil comes forth good. We should not have seen for many a year a truly educational Education Bill if the Cockerton Committee had not striven to dam (and damn) the progress of popular education. I am grateful to the Cockerton Committee—to the shaveling lord, and his dilettante cousin, and the art schoolmaster, and the civil servant more clerical than them all, who spun their flimsy web about the fly-wheel of the school system. They have been our benefactors in disguise. Molière wrote about the man who was a doctor in spite of himself, and the *bourgeois* who all his life had talked prose without knowing it. The Cockerton Committee have been educationists without intending it. Lord Hugh Cecil has helped the cause of popular education *malgre lui*.

I daresay that the anti-Board-School party are congratulating themselves on the fact that the new Education Bill is to put denominational schools on the financial footing of Board Schools. I can understand that the Cockerton Committee will be cunning enough to claim that *that* was the real objective at which their manœuvres were aimed. Short sight again.

A wiser set of men would have foreseen that to fight the School Board system by means of furbished-up weapons from the armoury of the nation prior to 1870 *must* result in new action against reaction and the legislative bursting of legal bands and swathings. Similarly, persons of anything like prescience must recognise that from the moment a voluntary school becomes wholly dependent on public funds its essence has changed, and the attitude of the public will change towards it. The Education Bill of 1902 appears designed to revivify the voluntary schools, but its real meaning is to revolutionise them.

A recent book of philosophy draws attention to the remarkable way in which the spirit of the age (whatever the Age and its particular Spirit may in a given case be) unlooses the bonds, unlocks the doors, and smooths the path for change beforehand. The philosopher in question cites, for example, the way in which the ideas which caused the French Revolution found their warmest supporters among the French nobility *before* the outbreak of "the red fool-fury of the Seine." Even so has the spirit of the age prepared the way for the change in this country from voluntary to public and popularly-managed education, by unloosing the bonds of opinion among the clergy and the clericalists first. They became gradually in favour of rate-aid, and rate-aid means the death of the voluntaryist system.

Not the death of the denominational system, however. Wherever concurrent denominational instruction in schools becomes recognised by law, it seems to be permanent. Ireland is an instance; the border-line between Lutheran and Roman Catholic Germany is another. What the new Education Bill means death to is the private, clerical, and voluntaryist control of schools. And this is a distinction which opponents of the voluntary schools too seldom draw. I mean the distinction

Next Month:

CORONATION FEATURES

Will Appear.

between *clericalist* and *denominational*. A school that is denominational under clerical control unchecked is one thing; a denominational school under a local authority is very much another.

Methinks that the Cockerton Committee is doubly hoist with its own petard. The efforts of the committee have given a fillip to public education, and will bring about the ruin of voluntaryist management of schools.

With very mixed feelings indeed the various members of Parliament have received the Education Bill. Nearly everybody was prepared to find it a failure; hardly anybody expected that it would be wise and workmanlike, and apt to become a success. The crassness of former efforts, the colossal ignorance of the situation displayed in 1896 and 1901, were expected to be manifest again. But the prophets of evil were disappointed. Incredibility still survives to some extent; there is a disposition among M.P.'s to believe that the Government cannot be in earnest. Prophecies of evil are still rife. The Whitsun recess and the Coronation adjournment are mentioned as lions in the path, and dangers to ultimate success they certainly are. But the Bill having got its first reading prior to Easter, there appears to be no real parliamentary reason why it should not go on to all its stages this session, and in due course become dignified into an Act, and pass into the law of the land. It almost seems as if the Government were in earnest, as well as wise, this year in this matter.

There is some chuckling among M.P.'s over Sir John Gorst's discomfiture. He has been deliberately passed over with regard to this Bill. His "illness" was of a problematical nature—the kind that royal personages occasionally have when they do not wish to receive or be received at diplomatical crises. Sir John is neither loved nor esteemed in the House of Commons, and his absence from the first reading debate came to most M.P.'s as a pleasant relief. He has worn his kind of humour thin, and he is recognised as a positive danger to commonsense in education. "A good man gone wrong" is the mildest verdict passed upon poor Sir John.

The two main points of interest about the Bill are the permissive clauses and the voluntary school clauses. Two schools of thought exist as to the permissive clauses. A good many governmental M.P.'s are in favour of *compelling* county, county borough, and other councils to take over the responsibility and control of elementary education; but a good many more are opposed to such compulsion. The rural and anti-ratepaying M.P.'s form the bulk of the latter, but there are others who hold that Parliament *ought not* to compel localities to rate themselves for denominational schools. The two main points are almost one point, and that is where the topic is ticklish. I will not be so bold as to prophesy what will be the result.

To be frank, the prospects of the Education Bill do not improve. Conservative members of Parliament go about shaking their heads and saying, "Will our fellows stand by the Bill?"—"our fellows" being the elegant locution which is used to indicate the members of the Government. The spirit of the Opposition is correspondingly rising, and Liberal M.P.'s who at first favoured the Bill are beginning to weaken at the knee about it. The threats in the country that Nonconformists will refuse to pay the rate proposed to be levied for the purpose of subsidising denominational schools are giving point and edge to the opposition that is developing, and the question arises menacingly, "What, after the second reading, will the Government do?"

I should not be in the least surprised if the Government drop all that part of the Bill which relates to elementary schools. A smaller deletion would be the part relating to voluntary schools. But whichever omission takes place, the fire of criticism on the Government can hardly be lessened. For if the elementary school part of the Bill is struck out by the Government's filicidal hand, many of the Bill's present supporters will turn against it, and notably the educationists in the House; and if the part of the Bill relating to voluntary schools be omitted, the influence of the Church of England and of the Roman Catholic Church will be seen in the attitude of many English and Irish M.P.'s.

No, the outlook is not promising; and the one consideration which seems to lead people to expect the Bill as a whole to be proceeded with, is the idea that the Government cannot afford a climb-down on the subject of education again. It is thought that Mr. Balfour's *amour propre* is involved, and he can be very stubborn when he likes. But time is strong enough even to overcome Ministerial stubbornness, and time is rather running against the Bill. The delay in the introduction of the Budget, due to the Chancellor of the Exchequer being ill, tells against the chances of the Education Bill, because the time thus left blank from legislation is being filled only by a drawling, dawdling treatment of the rules of procedure of the House of Commons; so that time is rather running to waste.

In short, the omens are against the Education Bill, although the lead given at Bristol by the Conference of the N.U.T., and a speech at Derby by Mr. Yoxall, are mentioned as signs of hope for it. I am writing this prior to the second reading, and can only speak prospectively, of course. Upon the second reading new symptoms may develop; but this is my diagnosis up to present date.

FERULA.

ENGLISH-SPEAKING STUDENTS IN PARIS.

At the request of the Comité de Patronage des Étudiants Étrangers at the Sorbonne, the Franco-English Guild has just established a new section of its work with a view to providing guidance and further educational facilities for English-speaking men students in Paris, especially for those preparing themselves to teach French in schools in English-speaking countries. The studies of the men students will be placed under the direction of M. Léopold Sudre, docteur-ès-lettres. Special attention will be paid to the study of modern French (language and pronunciation). The courses will begin immediately after the present Easter vacation. The Franco-English Guild examination, hitherto confined to women, will henceforth be open to men. Further information can be obtained from the Franco-English Guild, 6 Rue de la Sorbonne, Paris.

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BY MANY HANDS.

"*Quot homines, tot sententiæ.*"

THE PRACTICAL TEACHER is closely studied on the Continent, as extracts and notices in the foreign reviews which come to hand show. Our Belgian contemporary, *L'École Nationale*, in its last issue, gives its readers an excellent translation of the notice in THE PRACTICAL TEACHER on ambidexterity, and the evidence bearing on it from recent observations, medical and otherwise. We compliment M. Gaston Mouchet on the excellence of his version, which reproduces with fidelity the original. And we are gratified by our contemporary's sympathy, which is much more marked than was recently the case with the animadversions of Madame Sage, *la glaneuse* of *Le Journal des Instituteurs*, anent Mr. Yoxall. Any evidence of the solidarity of aims and interests of the teaching confraternity all the world over is always welcome.

Belgium and Paternoster Row.

THE recognition by a university of the good work done by one of their number is an honour conferred on the whole body of primary teachers in general, and at this particular period of educational history such a mark of appreciation is tenfold welcome. All the practical teachers of the primary schools of England must feel themselves, individually and collectively, honoured in the degree conferred on Mr. James Scotson of Manchester by the Victoria University, on the occasion of the jubilee of the Owens College. The veteran of the Peter Street and Deansgate Central, and now of the New Central Schools, was worthily chosen for public notice, as many generations of Lancashire lads will agree. The words *honoris causa* pronounced by the Chancellor, Earl Spencer, were never more fittingly applied, and have rarely been more completely earned. On that occasion a member of the French Academy, delegates from the Sorbonne, from great German universities, from distant America, and from many other seats of learning, in gorgeous academical costume, presented congratulatory addresses. And among the throng, brilliant in intellect as well as in dress, the band of those whom the Victoria University had chosen to honour filed before the Chancellor to receive the official mark of recognition, counting in their number one in whose preferment every primary teacher in England should feel a thrill of satisfaction. To Mr. James Scotson, M.Sc., we desire to present our own mite of congratulation.

Honour to whom Honour is Due.

A VIGOROUS correspondence is going on among the Belgian teachers on the question of Discipline in School. A director of a normal school who desires above all a military system of education, whatever that may mean, has propounded the following propositions respecting discipline. They are so striking in their reactionary character that we transcribe them for the benefit of our readers *seriatim*:—

Discipline and Militarism.

"1. Never speak to your pupils save with cold politeness. You should satisfy their vanity of 'little men,' and Mister them to their heart's content.

"2. A class is an assemblage of youngsters whose intention is to amuse themselves at the expense of the master.

"3. Never joke with your pupils.

"4. Always remain grave; express yourself in a magisterial tone; be pontifical.

"5. Never remit a punishment. *You had better pass for unjust than weak.*

"6. It is better to stick to the good old teaching methods of our fathers."

IF the introduction of a military system, whether of education or of anything else, involves the swallowing of these six astonishing propositions, Heaven guard us from militarism! There isn't a single statement but what violates what we had come to look upon as the very fundamentals of teaching principles. Flattering the vanity of a youngster by giving him "Monsieur as long as your arm," as M. Chomé puts it, is as farcical as it is immoral, while the description of a class might serve as a poor joke in the variety column of a newspaper, but is almost incredible in the mouth of a Normal College director. The *Pontifex Maximus* of the classroom, always inflated with the idea of his pontificate, could hardly be expected to indulge in jokes. *On ne badine pas avec un Pontifex.* Our advice would be to drop the pontifex and be merely human. But what is one to say to the hideous suggestion of No. 5? Is there no middle course between injustice and weakness? Does recognition of a fault always indicate the latter failing? As for sticking to our grandfathers' methods, well, they hadn't any at all; so we can dismiss the suggestion with a smile. But we confess we never saw a more reactionary set of suggestions.

The Pontifex Maximus.

TALKING of discipline, Dr. John Kerr tells the following story:—In the old days of certificate examinations the questions were printed on the margin of the paper, spaces being left opposite for the answers. To the question, "Give four or five practical rules for the guidance of a teacher with reference to punishment," a student from the Western Isles of Scotland filled up the appropriate space with the following: "First lash him, then take off the trousers, then make him stand on a stool in the presence of the scholars, then put him out of the school." Four drastic rules, eminently practical, for guidance, in good sooth. But a delightful sense of insecurity creeps in as to the application. *Him* is decidedly ambiguous. Is he the teacher or the scholar? It is too indefinite for use, like the girl's recipe for Scotch broth, which was correctly given as to quantity and quality of ingredients, and the time required for concoction. But she added, "A few leeches may now be added if onions can't be had"—a recommendation which makes us as suspicious of her soup as of Donald's directions for discipline.

Scottice.

THE latest disciplinary novelty is proposed by a French lady teacher. She wishes railway stations to be turned into veritable national schools, where every one can find a piece of good advice, a worthy precept—something, in fact, to instruct and improve. She would like to see the French "gares" ornamented with the portrait of President Loubet draped with the tricolour, and wreathed with moral precepts, hygienic counsels, or some of those

Trains of Morality.

warnings which bring back the forgetful and wandering one into the right way! In this way would the French child receive lessons, profitable to conduct, in the spare moments, free from preoccupation, spent in railway trains and stations.

Now we avow that somebody's tea, and the new brand of chocolate, or the astounding remedy, bore us quite sufficiently. Their repetition *à l'infini* conduces to anything but moral progress. But we shudder at the disciplinary effect, not only on youngsters but on oldsters, of the portraits of prominent personages wreathed in moral headlines or hygienic precautions. Better the pills and the tea. They are bad enough in all conscience, but they are infinitely less exasperating than Madame Nectoux's moral picture gallery.

Next suggestion, please!

AT a time when every new expenditure on children or schools is jealously watched and contested here in England, it is agreeable to note the rapid growth of the *Cantine Scolaire* movement in France, particularly in the small towns and the rural districts. The teachers find the means of giving, at an infinitesimal cost, a good hot meal to those children who live too far from school to return home for dinner, and to those who are too poor to find a dinner even if they return. A halfpenny per week paid by each child buys all that is wanted in the way of salt, fat, and firing. Then each participant brings daily to the teacher a handful of vegetables ready peeled or prepared, and the ready skill of the French *ménagère* makes from these slender resources a hot, stimulating, and appetising dish, which not only comforts the children physically, but has a corresponding effect on their mental application. The *Cantine Scolaire* is an admirable thing. In other cases the *menu* is somewhat more ambitious, but the expense is in all cases phenomenally small. The French genius for cookery was never put to better purpose than in this movement for the comfort of necessitous scholars.

"Cantines Scolaires."

THE menu of the school at Allanche, in the Cantal, the central *massif* of France, a wild volcanic region, is so good that we quote it in full without apology:—

A Dietary.

Monday—Bouillon and fried potatoes.
Tuesday—Bouillon and macaroni cooked with butter.
Wednesday—Bouillon and mashed potatoes.
Friday—Bouillon and rice boiled in milk and sweetened.
Saturday—Bouillon and haricot salad.

"Bouillon," as all our readers know, is broth; and the dietary for the week strikes us as being eminently sensible and nourishing. It falls in pat with the habits of the country, and is amply sufficient, for bread is supplied *ad lib.*

Thursday is omitted, that day being in France the weekly school holiday. The *Cantine* movement is worthy of all praise. Without fuss or *réclame*, in a Help-Yourself-Society sort of way, at an infinitesimal cost, a good deed is being done every week which is of far greater real value than many more pretentious projects. So beneficial is it that the Minister of Education has promised to study it with a view to its official recognition.

NOT every reviewer would feel equal to hitting off the style of the Authorised Version in a phrase or two. Few, indeed, would think it necessary to criticise for the benefit of his readers a work which can no longer be regarded as new.

A Belated Criticism.

The writer of a recent volume of Scripture narrative for schools is careful to point out in his introduction that he has adhered so strictly to the words of the Authorised Version as to include only a score or so of his own words. In a notice of this work, however, which appears in a contemporary, we read, "The work is admirably executed and interestingly written." Can it be that the story presents to the reviewer the charm of novelty, and that he does not recognise the style? Or does he merely wish to signify his approval of the work of Moses and the Prophets, and of their translators, from a literary standpoint? We cannot tell; but we should mention that the review is published in Edinburgh. This may help to throw some light on the question.

WITH OUR CHILDREN.

DR. SHUTTLEWORTH'S recent lecture to child students in London brought forward many important points worthy of attention by teachers. "What can be done for the morally defective child?" is a question which we are not yet in a position to answer, but it is one which we are bound to face. The lecturer did wisely in first diagnosing the disease. Every child is at first non-moral, acting from impulses of varied type, self-seeking, but as yet unconscious of self. It is only when the child becomes conscious of the "I" and the "not-I" that morality becomes possible—rather, we may say, when he becomes conscious of the "I" and the "others;" for if the "not-I" did not include other personalities, morality as we know it would still be impossible. Morality regards conduct in society, and to this extent justifies Aristotle's dictum that it is "somewhat political."

A Problem.

MORALITY implies immorality. When conduct has reached the level at which the word "right" has a meaning, the word "wrong" also finds a place. Disregard of the ethical sense results in wrong conduct. Hence the child who acts with full consciousness of the distinction of "I" and "others" acts either rightly or wrongly—rightly if he recognises the claims of others, wrongly if he considers self and disregards others. Right conduct implies thought and training and the subordination of many natural impulses. It implies a stage of thought and of action which some children are slower in reaching than others.

"I" versus "others."

The child whose conduct lags behind his intellect unduly is a morally defective child. He is a possible or probable criminal. Hence the treatment of the morally defective child is not only a problem in education, but is a problem for all who consider social government and social development, and who regard prevention as better than cure.

DR. SHUTTLEWORTH recognises that there are criminals who may not have appeared morally defective in childhood. There may be degeneration as well as arrested development involved. He recognises three classes of "defectives"—(1) those who have been so from early childhood; (2) those who have become so at some physio-

A Classification.

logical crisis, such as puberty; and (3) those who have become so after some serious illness or sudden shock. Educators have mainly to consider the first two classes. The first has received some attention even in this slow-moving country; the second is at present receiving notice among students of the problems of adolescence in America and elsewhere.

FROM his own experience, the lecturer is convinced that there are some cases beyond remedial treatment. Such as cannot be cured, however, may be, and in the interests of society ought to be, under control. Much may be done by personal care and sympathy to eradicate the egoism which is the basis of all immoral conduct, and to develop the altruistic feeling.

Remedy or Control.

Some hints were given as to the most hopeful kind of treatment for moral weaklings. Not a large "institution" but a real home, in the country if possible; close personal interest; abundance of non-selfish occupations —physical and manual exercises, care of animals, gardening and the like; nature-study and other intellectual exercises of an outward tendency,—such are some of the influences which the lecturer regards as of most value.

OWING to a necessary alteration in the lecture programme, the London Branch was at its next meeting introduced to a cognate subject by Dr. Langdon-Down, who discussed the subject of "Neurotic Children"—a wider class, embracing not only the morally defective, but the intellectually abnormal of varied types, both as to defect and as to excess of nerve energy. Among the "signs" of this, the lecturer mentioned such traits as morbidness, difficulty of expression, talking to oneself, exaggeration of manner, forgetfulness, excessive fatigue, lack of tone, etc. The presence of any one such "sign" may mean very little, and there is especially a natural restlessness which indicates no neurotic tendency.

Neurotic Subjects.

MANY children show a neurotic tendency in susceptibility to emotion. This is often stimulated in modern life beyond what is safe. Exciting books and fairy tales, parties and pantomimes, music, even religious services, frequently overstimulate the emotional nature of the hypersensitive child, and thus develop neurotic tendencies. The excessive stimulation received by the keen or precocious child is a cause of weakness and want of balance in his nature which may have the gravest results in after-life.

Emotion.

AS in the case of the morally defective, so here also the wise course is a simple, natural life, so far as that may be possible. It is not heredity so much as environment that is at fault, and in this the educator and the parent find a gleam of hope. A little judicious indifference and wholesome neglect at home, a little less practice of the memory and more use of the hands in school, a little less exercise of the imagination and more time for drill or for dancing—all these changes make for wise progress in the end. To live a truly natural or even a comparatively natural life in this year of grace is no easy task, and the lecturer's advice may read a little like counsels of perfection. Still they demand consideration. They are the outcome of the wide experience of a specialist, and the danger against which he warns us is sufficiently real. The proportion of pupils in our schools who may fairly be classed as neurotic is large enough to make us think, even though thinking and speaking on such matters be open to the charge of "faddism."

Treatment.

THE question, as we have said, demands study. One advantage of its study will be that not only the abnormal or defective child, but the morally normal child as well, will ultimately benefit. The problem is how to develop the moral sense and strengthen the moral sentiments in children where these are abnormally weak. The answer to the problem will show also how to develop and strengthen the moral nature in the normal child. Between normal and abnormal there is no clear line of division; it is only a question of more and less. The laws of development are alike in all, though the rate of development may vary much. Every child is morally defective in the sense of being morally undeveloped. Hence the problem is really the quite general and universal one of moral education.

A Wider Question.

AS regards the question of mentally defective children, the Scotch Education Department has, in its new Code for Day Schools, made a step forward. To recognise the need for special provision for such children is at least something, and we may take it for granted that the intentions of the Department are good, even if its definition of the class referred to is rather peculiar.

From Dover House.

CHILD-STUDENTS do not always study children; they sometimes study one another. The month of June will be a favourable time for this pursuit in London, when the Coronation festivities are expected to attract, among other visitors, a number of child-students from America and the colonies. The London Branch B.C.S.A. is accordingly planning a conference, combined with certain social functions, where kindred spirits may commune together. Members of other branches will be welcomed, and are requested to apply for particulars to Miss K. Stevens, Carlisle House, Dartmouth Park Hill, N.W.

About the Coronation.

N.U.T. NOTES.

THE Bristol Conference has abundantly justified my last month's prophecy, and a few references from "an old hand" may not prove uninteresting. The elections—with one notable exception, to which I allude in the next paragraph—went according to popular prediction, and I append a table for those who love statistics:—

Election Results.

N.U.T. Elections (Executive).

Year.	Number of Candidates.	Average Number per District.	Districts with no Contests.	Old Members Unseated.
1898	86	7·2	...	3
1899	58	4·9	2	4
1900	60	5·0	1	4
1901	52	4·3	2	2
1902	56	4·7	2	2

V.-P. Election.

Year.	N.U.T. Membership.	Voting Papers Returned.	Number of Candidates.	Winner.	Winner's Poll.	Winner's Percentage of Votes.
1898	38,687	29,179	3	Clancy	15,506	53·1
1899	40,485	28,884	5	Jackman	7,679	26·6
1900	42,005	28,665	4	Blacker	13,711	47·8
1901	43,614	30,186	3	Croft	15,428	51·1
1902	45,153	31,494	4	Coward	16,109	51·1

The success of Mr. Harry Coward must have been peculiarly gratifying to himself and friends, announced as it was in his own city, amidst the thunderous plaudits of those who knew his work most intimately. He received an ovation when, in response to the President's call, he thanked Conference for the distinguished honour conferred on him. Messrs. Sharples and T. H. Jones were both so warmly welcomed that it is evident the highest distinction will be theirs, either at Buxton in 1903, or the following year. Mr. Muscott polled less votes this year than last—a "tip" of sufficient significance to cause him to relinquish the quest, if he possesses the acumen usually accredited to V.-P. candidates.

ALL the former Executive members were returned, with the exception of Messrs. Gregory and Waddington; and the non-success of the latter gentleman provided a profound sensation, being rightly regarded as a disaster to the Union. Writing in last month's PRACTICAL TEACHER, I described him as "our ablest debater, as well as our most far-seeing and courageous fellow-member." My "appreciation" continued: "He has 'specialised' on almost every branch of Union activity, and were I in 'a tight corner' I would sooner have him as my champion than any other of the many able men I am privileged to know. A torrent of verbosity cannot add to such appreciation and confidence." It is an open secret that Mr. Waddington was mainly responsible for the series of resolutions submitted to the Bristol Conference on the Education Bill; and the masterly fashion in which he opened the debate, and the still more admirable manner in which he replied to his critics, will never be forgotten. When the news of his defeat became known, Conference realised intuitively how great was the Union's loss, and wherever he appeared he was greeted with unprecedented enthusiasm. The system of election which places "geography before brains" stood self-condemned at Bristol; though, were the Lancashire election taken over again, I believe he would be once more in his proper place—at the head of the poll. Mr. Gregory, it is understood, hardly expected to be successful. He was fighting in a new district, where the sitting members were both able and highly esteemed. He has the satisfaction of going into winter quarters after seeing the N.U.T. library a pronounced success.

Mr. Waddington's Defeat.

THE arranged agenda was naturally cast to the winds—and Easter week at Bristol was surely breezy enough—in view of the somewhat unexpected production of the Government's Education Bill. The Brighton precedent of 1896 was followed, and the mornings of Tuesday, Wednesday, and Thursday were all devoted to a close consideration of the proposals of the Cabinet. The fiercest battle raged around the first of the resolutions submitted by the Executive, and eventually this was agreed to without dissent. The registration rules came in for severe handling, and Mr. Marshall Jackman was responsible for a dramatic interlude, when he literally rent the rules *coram publico*.

Business Done.

THE one private session was absorbed by a somewhat trivial and undignified discussion on the Union's finances, and Mr. Hamilton, the genial treasurer, experienced an unusual amount of heckling. No one is desirous of burking the fullest examination of the various items of the Union's balance sheet. Yet I cannot help thinking that a new standing order is required which shall insist on all questions to the treasurer being submitted *in writing* before the session commences, and which shall prohibit, as far as possible, supplementary questions. The zealous, hard-working chairman of the Finance Committee, Mr. F. Peaker, had his annual "day out" when defending the Executive's travelling expenses. Although he performed the uncongenial task exceedingly well, one or two of his statements came under the category of "things better expressed differently."

A Suggestion.

MY occupancy of the chair necessitated the closest attention to every spoken word; and I have the satisfaction of knowing that, by common consent, the speaking was of a high order throughout the week. The metropolitan teachers fairly revelled in the discussions on the Bill, although London is expressly excluded from it. The best speech of the week came from Mr. Waddington; and this is saying a great deal when one bears in mind the delightful efforts of Dr. Macnamara, M.P., and other oratorical giants. Mr. A. R. Pickles, on "The Register," was in magnificent form, and rarely have polished period, epigram, and happy humour been more charmingly commingled than by the Burnley gentleman. The Bristol veteran, Mr. J. T. Francombe, was, without a doubt, in the forefront of the week's successes. His quaint and almost indescribably witty sallies convulsed the Conference on several occasions, and underlying these was the solid substratum of *point*, which pressed his arguments home in irresistible fashion. My conclusions are: (1) That no *new* reputations were made; and (2) that one or two old ones were slightly imperilled. As the picturesque reporter now and then has it, "To particularise were invidious."

Speeches.

THE "Purse Day" is perhaps the most attractive of all the Conference functions, and despite the slight feeling created regarding the chairmanship, everything passed off as pleasantly as possible. At my own personal request, Mr. C. W. Hole, the chairman of the B. and O. Council, delivered an address on the splendid work done by the Funds. His speech was dignified, impressive, and at times so pathetic that I regretted he was speaking to "the converted," and not to those who steel their hearts against every appeal to aid the sick, the suffering, and the distressed. The Duchess of Beaufort not only received the purses in a most charming and sympathetic manner, but in a few felicitous sentences expressed her delight at being able to assist so worthy and deserving a charity.

The Purse Day.

I trust we have heard the last of the query, "Who

shall preside at the Purse Day?" The President of the Union is, *ça va sans dire*, the biggest man of the week, and to any function over which he presides accrues some of the dignity attached to his high office. The chairman of the B. and O. Council ought, in his turn, to have a most honourable and prominent position, and I think "the happy medium" has been found in the arrangement as carried out at Bristol.

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Next Year.

A VERY lively contest has been going on for some months for the honour of entertaining Conference in 1903, and, to the surprise of not a few, Buxton gained the verdict with thousands of votes to spare. That a small association of some forty members should be ready and eager to undertake the gigantic responsibility speaks volumes for their pluck and zeal. Naturally they will look for assistance to the neighbouring associations, and they will not look in vain. I wish them every success in their year's work.

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Reflections.

THE new arrangement which split up the opening day's session into two parts was so greatly liked that it is bound to be followed next year. No President ever had a finer audience or closer attention than I, on Easter Monday afternoon. Throughout the Conference the attendance was exceptionally large; and when the curtain was rung down after the "vote of thanks to the chairman," members seemed to leave the hall with feelings akin to regret that it was "all over." There was not a dull moment from the time of one's arrival in Bristol to the hour of departure. The Union will be ever grateful to the high-spirited men and women of Bristol and neighbourhood—and more especially to the Bath teachers, who royally entertained 1,200 delegates at their own fair city—for the completeness and efficiency of their labour of love.

A. C.

NOTES FROM THE NORTH.

King's Scholarship List.

AGAIN the Scholarship List shows a somewhat marked decrease in the number of candidates presented for examination. For the sake of comparison I give the figures for the last four years:—

MEN.

	Presented.	Passed.						Failed.
		1st Class.	Arts. 70, 95, &c. P.T.'s.	Arts. 70, 95, &c. Non-P.T.'s.	2nd Class.	3rd Class.	Total.	
1898.....	341	92	21	16	94	69	292	49
1899.....	327	82	28	10	107	69	296	31
1900.....	297	67	47	51	57	50	272	25
1901.....	254	37	82	35	46	31	231	23

WOMEN.

	Presented.	Passed.						Failed.
		1st Class.	Arts. 70, 95, &c. P.T.'s.	Arts. 70, 95, &c. Non-P.T.'s.	2nd Class.	3rd Class.	Total.	
1898.....	1304	308	48	17	460	246	1079	225
1899.....	1343	302	78	17	444	300	1141	202
1900.....	1239	230	152	61	362	255	1060	179
1901.....	1184	177	204	51	306	258	996	188

From these figures it will be observed that the number of candidates, both men and women, presenting themselves for examination is steadily decreasing. In the case of the men there is a decrease of eighty-seven this year, as compared with the number in 1898—equal to fully 25 per cent. The cause of the falling-off has frequently been referred to in these notes, and it is with great satisfaction that I note the prominence given to the causes by President Croft in his Bristol address. The decrease in the number of women candidates since 1898 is a hundred and twenty, or nearly 9 per cent. This decrease is largely due to the lack of sufficient college accommodation. Considering the great demand for teachers consequent upon the provisions of the Code, and during this last year the appointment of so many teachers to South Africa, I feel certain a dearth will be very acutely experienced in the near future. Already signs are not wanting of its approach, and measures will require to be taken if it is to be averted.

It is also worthy of note that the number of pupil teachers who are gaining admission to the training colleges by means of Leaving Certificates and the University Preliminary Examinations (Arts. 70, 95, etc.) is on the increase. This year the increase is considerable.

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Central P. T. Classes.

I HAVE tabulated the results of the examination according to the districts from which the candidates come, and I find the following interesting details:—

FIRST CLASS IN ENTRANCE EXAMINATION.

	North.	South.	Aberdeen.	Edinburgh.	Glasgow.	Govan.
Men.....	6	11	2	3	14	1
Women...	50	35	35	10	32	7

ADMITTED BY ARTS. 70, 95, ETC.

	North.	South.	Aberdeen.	Edinburgh.	Glasgow.	Govan.
Men.....	28	29	0	6	14	5
Women...	77	76	0	25	14	12

From these figures it appears that at the entrance examination Aberdeen has done extremely well, especially with regard to women. It has taken of the first forty places no fewer than nineteen, among which are the first, second, third, fourth, sixth, ninth, etc. There is in Aberdeen a central pupil-teacher class, and all honour is due to the good work done there. Edinburgh fares somewhat badly in this table, and Glasgow stands well. Edinburgh is almost the only city that has not yet provided central classes for pupil-teachers.

It is to be noted, however, that Aberdeen sends no candidates up for the training colleges by means of Arts. 70 and 95, while Edinburgh takes very large advantage of this means, and so shows almost as well as the cities having central classes.

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Increase of Superannuation Premiums.

BY a Treasury warrant the rate of contribution to the Deferred Annuity Fund in the case of men teachers in Scotland has been increased from £3, 5s. to £3, 10s. on and after April 1, 1902. This is in accordance with section 1 (3) of the Superannuation Act, which enacts that if the average salaries for any one year exceed by ten per cent. the sum of £119, 13s. 3d., the rate of contribution may be increased by a sum not exceeding five shillings a year. This rate was found in January 1901 to have been increased by ten per cent.,

and in January 1902 by twenty per cent., the average salary at the latter period being £146, 0s. 11d.

This statement is somewhat misleading, as the average salary taken, £119, 13s. 3d., was that of the English men teachers; whereas the average salary in Scotland, as found in the Blue Book of 1898–99, was £142, 6s. 10d.; so that the actual increase is an average of £3, 14s. In fact, if the average salary at 1898–99 had been £143, 12s., there would then have been an increase of twenty per cent. on the sum mentioned in the Act; it only needed an increase of £1, 6s.

Some Boards in Scotland, and not a few public men, who should have known better, have been making statements with regard to the increase in teachers' salaries—twenty per cent. since 1898. It is well, therefore, that the right state of matters should be given here. Salaries will require to rise to an average of £155, 11s. 3d. before another increase in rate of contribution can take place.

NO doubt the present war has given a great impetus to the question of physical training in schools. It is not surprising, therefore, to find that the King has been pleased, on the recommendation of the Secretary for Scotland, to appoint a Royal Commission to inquire into the opportunities for physical training now available in the State-aided day schools and other educational institutions of Scotland, and to suggest means by which such training may be made to conduce to the welfare of the pupils; and, further, how such opportunities may be increased by continuation classes and otherwise, so as to develop, in their practical application to the requirements of life, the faculties of those who have left the day schools, and thus to contribute towards the sources of national strength.

Physical Training in Schools.

The Commission will be composed of the Earl of Mansfield (chairman), the Hon. Thomas Cochrane, M.P., Sir Thomas Glen Coats, Bart., Sir Henry Craik, Mr. Shaw Stewart, M.P., Mr. Carfrae Alston, Mr. J. B. Fergusson, Mr. G. M'Crae, M.P., and Professor Ogston. The teaching profession might, I think, with advantage have been represented on the Commission, as there are many teachers who have taken a prominent part in the Volunteer movement throughout the country, and are in a position to give valuable assistance in the matter of physical training in schools.

THE question of improving the General Committee of Management of the E.I.S. came in for full and free discussion at a recent meeting of that committee. The proposal to reduce its size met with much opposition, and was rejected by a small majority. To compromise matters, however, it was resolved that the committee should meet more frequently—namely, eight times a year. While, in some respects, the compromise is good, yet it must be pointed out that it will mean a considerable increase in expense each year. The expense of committees is already very great, owing to the great number of sub-committees that are appointed. The abolition of the special committee, as contemplated by the new rules, will help to keep down expenditure, but I question very much if it is the right method of doing so. I would rather that the number of sub-committees had been reduced, the special continued, and its work made more effective and comprehensive.

E.I.S. Notes.

The voting for the vice-presidentship and general committee takes place during May. Whatever may be the result, there is likely to be an introduction of new blood, as some of the old members are not candidates this year. I trust there will be greater interest in the matter than was shown in some quarters last year.

There is not likely to be a new Bill for Education introduced into Parliament this session. The Institute, however, are prepared to act at once should such a necessity arise; but the general feeling is that they would rather not have any Bill at present. R. G.

FATIGUE CURVE AND REST PERIODS.

BY JOHN ADAMS, M.A., B.SC.

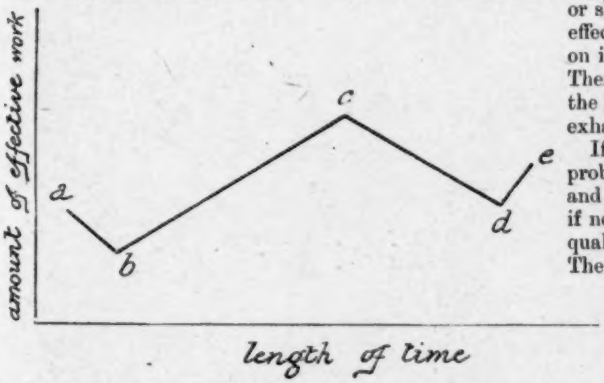
ALL real students have had experience of what may be called "mental second wind." As in running we begin by losing our breath, and gradually go on till we attain a condition in which we can breathe steadily and still continue running, so in mental work we sometimes find that if we keep doggedly at it till we pass through the stage at which we cannot concentrate our thoughts, we reach a condition in which we can go on with our work easily, and with apparently good results. Fatigue seems to disappear, and we get a new lease of vitality. Physiologists regard this second wind in mental work as essentially pathological. They say that the fatigue has not really disappeared, but that it has lost the power of giving us the warning symptoms that natural fatigue never fails to supply.

In actual life it may be necessary to fall back upon our second wind, but never in the work of education. In ordinary experience a given piece of work has often to be done within a given time, cost what it may; but the teacher is concerned with the process and its effect as training, not with the material results that usually correspond to the phrase "work done." The economic law of increasing and diminishing returns holds in the expenditure of energy. The work done in four periods of two hours each, with breaks between, is economically much more valuable than that done under the same conditions in eight consecutive hours. Opinions differ as to the value of mental work done by the second wind. Many maintain that the cold criticism of "next morning" owes much of its terror to the fact that the midnight lamp lights up a ghastly exhibition of second-winded strain. It becomes important, therefore, to determine the point at which fatigue sets in to such a degree as to interfere with efficient work.

Most teachers know pretty well when their classes are tired, but their decisions are based not so much upon any definite symptoms as upon the general appearance of the pupils. In one of his interesting if troublesome investigations, Mr. Francis Galton found that teachers could not supply him with more than general impressions. One daring lady, it is true, professed to be able to tell from the tips of her pupils' ears whether the girls were fatigued, and what they were fatigued by. If the ear-tips were white, flaccid, and drooping, then the pupils were mentally worn out; but if the tips were flaccid as before, but of a purplish tinge, then the girls were fatigued by the strain of keeping their nerves in order. This lady, however, was quite exceptional. The others restricted themselves to vague generalities—as, unusual skin colour, restlessness, worn look, fixed gaze, lack-lustre eye. Some writers give us more definite

directions. Most teachers glory in such a pointed recipe for testing fatigue as: Make your pupils stretch forth their arms at right angles to the body and with the hands prone. If the thumbs are kept at the same level as the rest of the hand, the class is not tired: drooping thumbs mean fatigue.

Wise teachers are distrustful of all such cut-and-dry methods. Careful investigators do not rely upon any one test; they employ a great number—some physiological, some psychological. Questions of the respiration, the vaso-motor system, alimentation, the secretions, are for the laboratory. But several of the psychological tests are of great interest to the teacher. A common test is the rapidity with which the subject can perform certain easy additions, or learn off certain series of numbers in their order. The work, being purely mechanical and entirely within the pupil's power, forms a ready test. If, after being tested before an hour's work at a given subject, a pupil falls off in the accuracy and rapidity of his test summations or memorisings, the degree of falling off may be used as a standard of fatigue. The same is true about dictation, with the proviso that the passages chosen must be of such a kind as to present no difficulties to the child when fresh. When fatigued, the best spellers make mistakes. When we get a letter



from a friend in which *the* has to do duty for *they*, and *to* for *too*, and even the fatal *there* for *their*, it is always kinder, and almost always truer, to blame fatigue rather than defective education.

To make the test a little more mental and less purely mechanical, Ebbinghaus used a sort of missing-word arrangement, that was at one time not uncommon in our school books. The time taken to fill the gaps, and the accuracy of the parts supplied, formed a capital standard of comparison. The danger in setting such a passage is to make it too difficult. The following is taken from *Jane Eyre*. Each dash represents a syllable.

"October, N---, D--- passed -y. One -noon in J----- Mrs. Fairfax -d begged a -iday - Adèle b-- she -d - cold, and as Adèle sec-ed - request with - ardour that re-ed me how -ious oc--al holi-- been to me - my -hood, I acc-ed it; deem-- I d- well in -ing plia--ty - the point."

Sometimes such a passage is set without having been previously seen by the pupils, but some experimenters think that they get rid of certain disturbing influences if they give passages that have been recently read in their complete form by the pupils in the course of ordinary work.

One of the most important results of all this experimenting is the discovery of what may be called the fatigue curve. This curve may represent any period of time, but for teachers the two-hours curve is the most interesting, as that represents a very common length of time in school work.

In the above diagram of the effective work done in two hours, there is (1) a period of a few minutes during which the power of effective work actually diminishes, from *a* to *b*; (2) a period of from twenty-five to sixty-five minutes, during which the power of effective work steadily increases, from *b* to *c*; (3) a period up to about the end, during which there is a steady falling off, from *c* to *d*; (4) a period of a few minutes at the end, when the power increases slightly on account of the stimulus given by the immediate prospect of a release from effort. The explanation of the initial falling off is that the mind is at first distracted by its efforts to concentrate the attention on the work in hand, or, perhaps more correctly, to draw the attention away from what has previously engrossed it.

To understand the two longer periods, we must take account of two forces in operation. One may be called the fatigue effect of work, the other the practice effect. Both effects begin at the very beginning of the work, but at first the practice effect increases much more rapidly than the fatigue effect. After a time—how long or short depends on the individual subject—the practice effect reaches its maximum, while the fatigue effect goes on increasing. The two forces are in exact poise at *c*. Thereafter the fatigue effect gets the upper hand, and if the work is continued long enough, will cause absolute exhaustion.

If we considered only economical reasons, we should probably make *c* the point at which to leave off work, and take a rest; but the work done on the down-grade, if not so profitable quantitatively, is not necessarily poor qualitatively, if the total period of work be not excessive. The comforting thing about rest is, that while there are two effects dealt with, one is much more easily removed than the other. Given time, rest will remove both the fatigue effect and the practice effect, but the fatigue effect goes first. A couple of hours will remove a moderate fatigue effect, while the corresponding practice effect will be carried over till next day, or even the day after that.

To determine the value of different periods of rest, Amberg, in 1896, made some interesting experiments. These took the form of five series of tests of eight days each. During the odd days (1st, 3rd, 5th, 7th), the subjects worked steadily for an hour without interruption. During the even days, rest and work were intermingled in various ways:—

1st series—Half-hour's work; five minutes' rest; half-hour's work.

2nd series—Five minutes' work and five minutes' rest alternately during two hours.

3rd series—Half-hour's work; fifteen minutes' rest; half-hour's work.

4th series—One hour's work; fifteen minutes' rest; one hour's work.

5th series—The same as 3rd series, only the work given was learning off numbers, while in 3rd it was addition.

The *general* result was that from day to day the power of work increased, thus proving the carrying over of the practice effect. Of the separate series, the results were as follow:—In first series the effect of five minutes' rest was favourable: the addition was better during the second half-hour. The third series had a neutral result,

while the fifth had a slightly favourable one. The only importance of this result is that it shows that the nature of the work has its effect.

The most interesting result is that from the second series. At the beginning of the two hours, the effect of the five minutes' rest was unfavourable, but towards the end it was distinctly favourable. This could not be caused merely by increase in the practice effect, for its maximum is soon reached. Therefore Amberg felt compelled to assume a new element in the case, a something that may be called the "swing." There is a distinction between the skill resulting from practice and the power we acquire when we warm up to our work. It is this warming up that Amberg assumes as a new factor. His theory is, that in the 3rd series of additions the half-hour is too short for the subject to get the swing, whereas in the 4th series the first hour's work is sufficient to get the subject warmed up to his work, and carry over the swing to the second hour. The swing does not seem to persist nearly so long as the practice effect, but it lasts longer than the fatigue effect; which brings it about that a quarter of an hour between two hours is sufficient to get rid of more fatigue than swing, and therefore to improve the work of the second hour.

From all that has gone before, we are not unprepared to find that the practical recommendations of writers are far from consistent. Some propose that all lessons should be of half an hour, others prefer three-quarters, some hold out for the orthodox hour. All, however, agree that the period should be very short for very young children. Clearly, then, teachers must decide for themselves; hence the extreme importance of knowing what is being done in the way of getting material upon which to base their decisions.

THE PRESIDENTSHIP OF THE EDUCATIONAL INSTITUTE OF SCOTLAND.

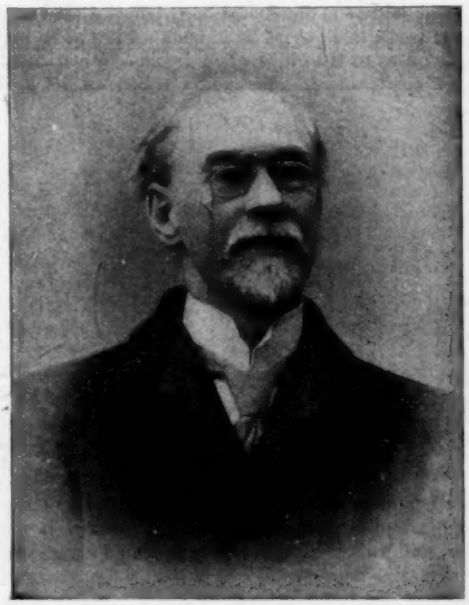
FOR the second year in succession "the blue riband" of the teaching profession in Scotland has been obtained without a contest. Last year saw the country parochial teacher, Mr. Rae, Wamphray, appointed to the highest office, and this year the largest branch in Scotland has sent the candidate. To some the want of a contest will betoken indifference, and lack of interest in Institute affairs; to others—and these the great majority—it shows the growth of the feeling that in the filling up of the presidentship there should be no vote. Popular election is not favoured by some, and it is suggested that other means than the nomination by branches should be resorted to in connection with the presidential chair. We rather fear it will be difficult to go back to the old method of selection—namely, by the ex-presidents—though such a procedure has much in it to recommend itself, as it is more than likely that they would take the greatest care to see that the highest office of the Institute did not suffer in dignity at least.

The Institute, however, is this year again most fortunate in the man of its choice—Mr. A. T. Watson, M.A., rector of Dumbarton Academy, and a member of the large, flourishing, and thoroughly active branch of Glasgow. It may be of interest to many if we give a brief sketch of Mr. Watson's career, inasmuch as though he is well known and exceedingly popular in the west of Scotland, many elsewhere are not so well acquainted either with Mr. Watson or his work.

Mr. Watson was born about the middle of the century, in the town of Dundee, and is the son of a most successful teacher and well-known musical critic of that town. His early education was obtained at the West End Academy, Dundee, where, in the course of time, he became a pupil teacher. Mr. Watson was peculiarly fortunate, in those formative years of his life, in being under the influence of Mr. George Clarke, M.A., one of the most enlightened teachers of his day. To his influence, no doubt, may be attributed that ardent enthusiasm for teaching which is such a prominent characteristic in Mr. Watson.

On the completion of his apprenticeship Mr. Watson entered St. Andrews University, at which he obtained one of the highest open bursaries. During his four years' study at that ancient seat of learning he gained numerous prizes in nearly all his classes, but especially distinguished himself in classics, English literature, logic, and philosophy. At the same time he made a special study of the modern languages, French and German, though these did not at that time form part of the university curriculum.

On graduating as M.A. in 1868, Mr. Watson was appointed assistant-master in the High School of Dundee; which position he occupied for four years. He was then appointed rector of the Academy in Peterhead, where he successfully laboured for two years. Shortly after the passing of the Education Act in 1872, he was selected for the headmastership of the Girvan Burgh School, Ayrshire. His work there was of the most uphill and trying kind, as the school was called into existence after the passing of the Act. He remained there for three years, and earned the gratitude of



MR. A. T. WATSON, M.A.

the School Board and the people of that district for the tactfulness with which he overcame the many difficulties that confronted him, and for the high state of efficiency to which, in such a short time, he was able to raise both the elementary and the secondary portion of the school.

In 1876 Mr. Watson was appointed rector of Dumbarton Academy—a position which he still retains. It is interesting to note that he succeeded in this post the genial secretary of the Board of Examiners, Dr. H. Dickie. During the last quarter of a century Mr. Watson's work has been most successful, and his reputation as a teacher of undoubted ability has been acknowledged by the people in that famous shipbuilding place. Although the Academy has been and still is a grant-earning school, Mr. Watson has succeeded in sending direct to Glasgow University, year after year, some of its most distinguished graduates in all the faculties. Long before the movement for the higher education of girls was as popular and pronounced as it is to-day, Mr. Watson enabled a clever pupil teacher of his own to enter Girton College, Cambridge, straight from school, and in doing so to gain the "College Scholarship" in the open entrance competition.

Mr. Watson has also devoted much of his time to pro-

fessional work. He has been a member of the Educational Institute for over seventeen years, and during that time has taken an active and prominent part in the affairs of his branch. Last year Mr. Watson was a member of the G.C.M., and also of the Special or Executive, and in these capacities showed his usual vigour and clear-headedness. As a member of the Higher Education Committee, his practical acquaintance with both classes of school, elementary and secondary, was valuable. From his thorough and intimate knowledge of educational affairs, from his ability and scholarship, from his deep and personal acquaintance with the needs and demands of higher education, Mr. Watson is well qualified to guide the business of the Institute. In him the honour and dignity of the chair will be well maintained, and his personality, we are sure, will be felt in all the committees, while his geniality and tact will go far to keep the wheels going smoothly. We have confidence that Mr. Watson's term of office will be characterised by earnest and efficient work, and that the progress of the Institute will be materially increased during that time.

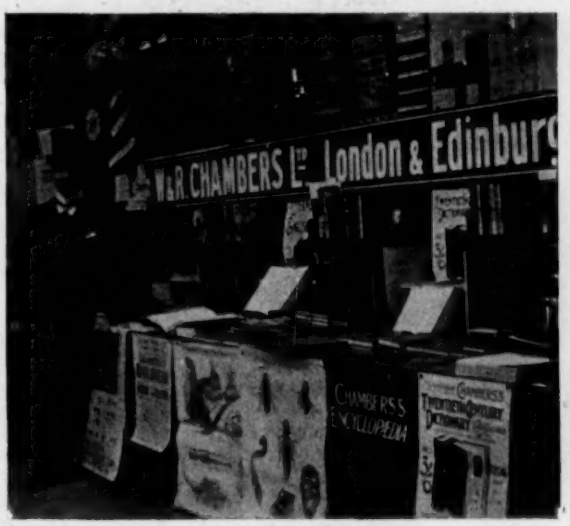
THE NOVICE AT THE CONFERENCE.

ALTHOUGH a member of the N.U.T., I had never before attended a Conference; so I determined to go to Bristol this year, just to see what it was like. Of course I had heard a good deal about conferences, having carefully studied the reports in the scholastic papers; and, moreover, it is a custom in our association to require the junior representative to give an account of his stewardship at the first meeting after Conference. This is generally very well done, although I remember one occasion on which the orator, instead of producing his notes, brought out a copy of a scholastic paper with a printed report of the proceedings, and the meeting unanimously voted that "the report be taken as read."

As I felt inclined strictly to business, I decided not to reach Bristol much before the real business began, and resisted the temptations of friends who tried to induce me to go down with them two or three days before. They were not novices, however, but I was, and trusted that the Plymouth express would leave Paddington at the advertised time, 7.25 a.m., on Monday morning, and in fact had the assurance from the local stationmaster that it would, although most of the early suburban trains were taken off. On reaching Paddington, I found not a few familiar faces with blank expressions in front of the Easter holiday notice board, and found that experienced representatives may also trust to trains that do not run on bank holidays. However, we found a later train, which—after two rubbers of whist—brought us safely to Bristol. Making straight for the Victoria Rooms, I found the first session nearly ended, and was assured by a Bristol friend whom I met in the vestibule that it was absolutely imperative to lose no time in securing a bedroom. Full of vexation of spirit, I thought I would get other people's impressions of the first session and palm them off as my own. But, alas! *quot homines, tot sententiæ*, as we read in a familiar heading. Some spoke of that gathering as wonderfully impressive; others called it merely formal; a third said that the speakers did not know what they were talking about, and that one was ignorant of the difference between an archdeacon and an archbishop; while one was chiefly impressed with the necessity of sitting near the door, as the attendance was so large, and the means of exit so small, that those who sat beyond the middle of the hall had to go without their midday meal if they wished to be present at the opening of the second session.

In the afternoon session I had the pleasure of hearing the president's address, which was admirable both in matter and delivery. Some expressions struck me with particular force, among them the statement that "Education is to-day largely what religion was in the Middle Ages—something which men would fight for, quarrel over—ay, even die for, but which very few cared to live for." He pleaded hard for the employment of well-qualified teachers, and uttered a profound truth when he said, "There is neither sense nor economy in allowing so many of the nation's children to remain under the tuition of unqualified teachers." Not only by his presidential address, but by his whole conduct in the chair, did Mr. Allen Croft prove himself worthy of the confidence the Union has reposed in him.

I cannot here undertake to report the proceedings, which are already well known to all the readers of THE PRACTICAL TEACHER: but one or two things did impress me at this my first Conference. First, there was the great earnestness shown by all the representatives. I once heard a man who failed to secure election as a representative make the unkind remark that teachers who got elected simply went to enjoy themselves. Now, although there were excursions and convivial gatherings, there is no question that the visitors to Bristol all meant business. Moreover, in carrying on that business Conference, under the able direction of the president, was as a whole an extremely business-like gathering. But when one came to consider the individual speakers, one felt inclined to believe the charge brought against some by Mr. Thompson, when he said that he knew that some members of Conference had prepared yards of speeches, for many individual speakers seemed to think that they had the whole weight of support or opposition on their own shoulders. Consequently no heed was given by a seconder to the fact that his arguments had been used before by the proposer of



the motion, and it did seem as though time was lost in repeating arguments instead of merely indicating agreement with them. Another point that struck me was that all the work of the meeting was devoted to questions of administration. Now, while I hold that teachers must have the full right to exercise their political and municipal privileges, and that in a question of educational politics no one has greater claims to be heard than the teacher; and I even go further, and think teachers do not do enough to bring educational matters to the front in ordinary political meetings,—still I should like to see the establishment of sectional meetings for the discussion of pedagogical questions, just as sectional meetings are held under the auspices of the British Association for those who are interested in particular branches of the work. The Temperance Breakfast was the only meeting that seemed to partake of this nature; for although there were special gatherings of rurals, assistants, centre teachers, members of the provident society, etc., each one seemed to deal exclusively with material and administrative matters.

Finally, it is evident, from the attention paid to the proceedings by the press (including the hostile remarks of a writer in the *Morning Post* and *Daily Telegraph*), that the opinions of teachers have to be reckoned with.

THE PUBLISHERS' EXHIBITION.

It was remarked to the "novice" that the Publishers' Exhibition was not so much frequented as it usually is during Conference week. Maybe this was due to its secluded position; for in order to reach it one had to go through a long passage and "up a winding stair," in which was arranged a

rope to prevent those who were going up from mixing with those who were going down. The committee had also very considerately stationed men, like the Beefeaters at the Tower, at convenient points, to ensure that visitors kept to their proper direction; otherwise many would have walked round the exhibition twice, while others, after exploring the long passage, would have found themselves in the street again without seeing anything at all. The first rooms that one reached were devoted chiefly to school furniture. Here Messrs. Wake and Dean and the Benet Furnishing Company exhibited their various forms of school desks. An ingenious little trolley was also shown for moving pianos about from one part of a school to another. Messrs. Cresswell, Ball, and Co. showed some of their splendid pianos, which are made expressly to meet the needs of schools and the pockets of teachers, and many remarks from those who had tried them told of the success which had attended their efforts. The Yorkshire Educational Supply Company had a fine display of wood-carving and other manual-training tools, as well as challenge trophies and plate. Proceeding onward, we entered one of the rooms of the publishers properly so called, and could not help being struck with the appearance of American firms; and certainly the work shown was such as to make one feel that British publishers must keep their productions up to a very high level if they are not to suffer by the competition of such firms as Heath, or Ginn, or the American School Book Company. The Modern Language Series of the first named calls for special praise. On entering the large room, the first display that met the eye was that of Thomas Nelson and Sons. This firm had secured a large space, and had a large amount of material well arranged in it. Prominent among the various productions in this collection were the *Royal Prince* and *Royal Princess Readers*, made attractive by the beautiful examples of colour printing, of which the firm makes a *spécialité*. The wall space was well filled with pictures of animals and with drawing sheets, while a set of volumes of the New Century Library on beautiful India paper set the hearts of all longing.

Further on, the eye caught the *Fitzroy Pictures* of George Bell and Co., which give such splendid effect with their bold masses of colour. The same firm exhibited their well-known Arithmetics by Pendlebury, and a number of books containing short stories, forming readers full of very interesting subject matter. Their Illustrated Classics appealed to those visitors engaged in the higher parts of the work. At the other end of the hall were the exhibits of George Gill and Son, who catered largely for the wants of those taking the Oxford and Cambridge Local Examinations; and Messrs. Macmillan, with a wide assortment, including Arithmetics for Scheme A and Scheme B, History and Geography Readers, and Prize Library Books. Messrs. Pitman's stall contained a fine selection of books largely devoted to commercial education and to shorthand. Among other exhibitors we must mention Messrs. Blackie and Son, who showed some Arithmetics, Geographical Readers, and English Classics for schools; and as far as one could see, both the illustrations here and in their Greek and Latin texts were of the highest order of merit. Chapman and Hall's chief feature was the collection of works on Science and Art, two art books being specially attractive, as affording an instance of the enlistment of the cinematograph in the service of those who are studying the human form in its relation to movement. Messrs. Chambers, of *Encyclopædia* fame, showed some beautiful illustrated geographical readers, and a copy book with movable copy.

Messrs. Arnold of Leeds showed some of the new series of historical charts they are now publishing; and W. and A. K. Johnston exhibited some good maps, and a series of object-lesson pictures which will be found not only instructive, but decorative as well.

The volumes shown by the University Tutorial Press attracted those teachers who were anxious to improve their own studies. Special lines were shown by the Photochrom Company (coloured views), by Hardtmuth (lead pencils), by Curwen and Sons and Novello, Ewer, and Co. (school music), and by Tounson and Mercer (scientific apparatus).

OUT OF DOORS.

One of our illustrations will suggest to the initiated a new element in the recreations of Conference. Among those deserving honourable mention for the hospitality shown to Conference visitors, the Rodway Hill Golf Club and their worthy secretary merit a high place; and those who had brought their "golf sticks" took full advantage of the breezy uplands where the course lies. This, it may be

ON THE GOLF LINKS—"THIS FOR A HALF!"

hoped, will be noted as a precedent for future conferences. At Buxton, next year, we shall doubtless find, in addition to the "dinner secretary" and "ball secretary," a "golf secretary," whose duty and pleasure it will be to receive in advance the names of all golfing representatives, with their handicaps, and make arrangements for a series of matches during the week.

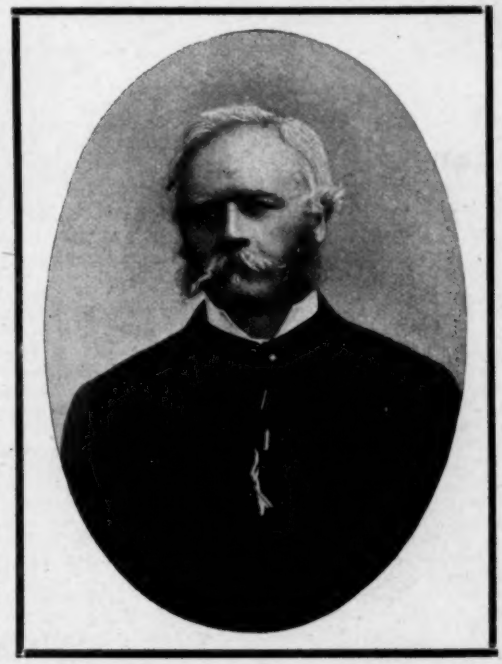
THE LATE PROFESSOR MEIKLEJOHN.

BY the death of Professor Meiklejohn, who had occupied the Chair of Education in the University of St. Andrews for a quarter of a century, the educational world loses one of its most notable figures.

A man of marked individuality, of large and liberal views, of indomitable energy and the soundest common-sense, he may be said to have done more for the advance of education by his series of books for schools and training colleges than all the codes and blue-books that have issued from Whitehall during the last thirty years.

Born in the year 1830, in Edinburgh, the "best-educated town of the best-educated country in the world," he graduated with distinction at the university there, and for a time followed his father's profession of school-teacher.

In 1864 he acted as war-correspondent to an English newspaper during the brief war between Prussia and Denmark which the recently deceased Lord Kimberley was sent from England to try to avert, and his experiences in that campaign no doubt helped to make the battle-pictures in his well-known histories striking and effective.



It is interesting to note in this connection that while the late Professor achieved high distinction with his pen, two of his sons have chosen to render their country service with the sword; the elder, Captain Meiklejohn of the Gordon Highlanders, being the first officer to go over the bullet-swept ridge of Dargai, and afterwards gaining the crowning honour of the Victoria Cross at Elandslaagte.

Returning from the Continent, Mr. Meiklejohn was engaged for several years in examining secondary schools, and as an expert member of the Endowed Schools Commission he drew up some extremely valuable reports on various higher-class schools in Scotland.

In 1876 the trustees of Dr. Andrew Bell, a clergyman of the Church of England, who had taken a strong practical interest in education in his lifetime, and at his death had left a very large sum of money for educational purposes, instituted a professorship of the theory, history, and practice of education in the University of St. Andrews, and Mr. Meiklejohn was chosen to fill the chair.

The subject of education was then, and for many years afterwards, outside the curriculum for the degree; the importance of training for the teacher was barely recognised, with the result that the students who were discerning enough to avail themselves of the benefit of the Professor's lectures could in some sessions be counted on the fingers of one hand. The duties of the post were thus by no means exacting, and his spare energy, of which there was an abundant store, Professor Meiklejohn threw into the work of reforming the deadly, dull, and time-worn manuals which, to the vexing of many young souls, had been the blunted weapons of the Scottish teacher. Under his able and inspiring editorship, school-books, conceived in sympathy with youthful minds, and brought forth into a world which sadly wanted something new and bright and beautiful, issued in quick succession from the presses of Messrs. Chambers and Blackwood.

The Professor possessed peculiar power of investing with living interest every subject he wrote upon—of breathing, as it were, on the dry bones and making them live. And if he left the heights of professorial dignity, and came down to the door of the village school with his infant readers and shilling Shakespeares, who shall say that he did not accomplish a far more useful work than if he had theorised and idealised in the academic isolation of his chair? The nature of the man was intensely practical, and whether in personal relation with his students, who all adored him, or in indirect contact, through his many text-books, with the great army of eager and diligent learners to whom his writings on geography, history, and literature were invaluable, he rendered the teaching profession the highest possible service. He was ever ready to step from his study on to the public platform, and no one was more cordially welcomed or more gratefully appreciated by the various educational bodies who from time to time were privileged to receive addresses from him. Students to whom the very idea of a course of formal lectures on education was repellent, flocked to hear the Professor when a public lecture on the teaching of geography was announced, and the largest classroom was sure to be requisitioned when he proposed to make a few remarks on some character in Shakespeare. He carried a breeze ever with him; his lectures were living pictures, and you enjoyed them as you did an unexpected holiday at the fag-end of a hard session.

The Professor made several excursions into the domain of politics, appearing as a candidate on the Liberal side at Dundee in 1874, and at Glasgow in 1886, but on both occasions unsuccessfully. Had the present movement among teachers for direct representation in Parliament, which has in England secured the services of men of the stamp of Mr. Yoxall and Dr. Macnamara, been successfully inaugurated in Scotland, an ideal representative would have been found in Professor Meiklejohn. With the broadening of the curriculum for the degree, and the inclusion of education as one of the subjects that might be chosen, the Professor had in later years opportunities of influencing larger numbers of students; and as the subject has always been a favourite choice with candidates for the L.L.A. diploma, he was able to keep in close touch with the younger generation of teachers.

His first attempt at authorship was a translation of the famous *Critique of Pure Reason* by the German philosopher Kant.

In 1881 he wrote a monograph on the founder of the education chair—*Dr. Andrew Bell, an Old Educational Reformer*; and in 1883 the *Life and Letters of Professor W. B. Hodgson*, a kindred spirit with whom he had long been on terms of intimate acquaintance. Both books are excellent biographies of men who were keenly interested in education, and the student of educational theory will find in them much stimulating and instructive matter.

Of the school-books which the Professor compiled, the best are those on geography and history, and there can be little doubt that his *New History of England and Great Britain* and his *New Geography on the Comparative Method* have done much to put the study of these subjects on the right lines.

In these books the author makes his facts "leap to the eyes," and the learner who would otherwise groan under the burden of the vast accumulation of names, and dates, and figures, finds his memory respond elastically to the touch of the Professor's magic wand. In reading the geography, one is struck by the amazing fertility of device shown in using the comparative method; unsuspected possibilities of education reveal themselves, and one feels oneself in contact with a master mind.

With an admirable style of his own, Professor Meiklejohn in his *Art of Writing English* does all that a writer can do, by precept and example, to communicate the secret of writing with clearness, distinctiveness, power, and beauty.

OUR CLASSROOM AIDS.

ARTS AND MANUFACTURES.

BY JAMES KNIGHT, M.A., B.SC., F.C.S., F.G.S., F.E.I.S., HEAD-MASTER, ST. JAMES'S SCHOOL, GLASGOW.

PARAFFIN AND OTHER LAMPS.

II.

ILLUMINANTS of various kinds may be classed under two great heads: those in which electric energy is converted into radiant heat—that is, light—as seen in the incandescent and arc types of electric lamp; and, secondly, those in which chemical energy is converted into radiant heat, as in all other forms of lamp in which a combustible substance—oil, wax, gas, etc.—is burned in air or oxygen.

These last may again be subdivided according as they burn solids, liquids, or gases, though, as will presently appear, all the oil lamps and solid candles are, after all, gas-lamps, since in each case the oil or wax is vaporised, generally by the help of a wick. Lamps based upon the combustion of solids are represented by all the candle tribe, of which more anon, and also by the magnesium light, so much used in "flash-light" photography and in photographing interiors of caverns and similar places. Take six inches of magnesium ribbon, straighten it out, catch it by the tongs at one end, and hold the other in a flame. The magnesium catches fire, burns with a very dazzling white light, and leaves behind as its sole product of combustion a white powder, magnesium oxide or magnesia. The action here is simpler than in any other lamp, and all that is wanted to make a good lamp is a clockwork arrangement for feeding magnesium ribbon to the burner at a uniform rate. For instantaneous or "flash" work a puff of magnesium powder is blown through a spirit-lamp or bunsen flame. The "lightning" of theatres is produced in the same way by using lycopodium dust, which burns very readily.

The second great class of lamps will include all those which burn liquids, generally oils; and here a division may be made according to the presence or absence of a wick. The common naphtha-lamp of the street dealer is an example of a wickless oil lamp. In this case the naphtha, stored in the can at the top, flows down the feed-pipe, where it can be regulated by a stop-cock, and is delivered by a fine nozzle as a thin jet of oil spouting up. This jet strikes against a metallic disk, and is broken into spray, in which state it is ignited. Another example of a wickless oil-lamp may be seen at almost any goods station, or any place where night work is going on. This is the Wells or "Lucigen" light, and it consists of the thick oils left in tar-distilling blown into a fine spray by steam or compressed air. Some considerable degree of pressure is needed here, for these residual oils are too thick for lubricating, not to speak of illuminating, purposes. The common type of oil-lamp is well known, and it may serve as the type of spirit and benzoline lamps, as well as of those which burn colza oil, sperm oil, or paraffin oil.

The third class of lamps includes the gas-lamps and those incandescent forms which require gas of some kind. Of those which derive their light from the burning gas directly, there may be mentioned the common gas-burner of the fish-tail pattern, the Argand, Siemens, and other "regenerative" gas-lamps which are supplied with heated air; also acetylene lamps, which are now fairly common, from bicycle size up.

Under the head of gas-lamps we may also include those in which the source of light is not the burning gas, but some incombustible solid which glows white-hot when heated. An old and familiar example of this is lime-light, in which a piece of hard, compressed lime is made to glow white-hot under the intense heat of coal-gas (or hydrogen) burning in oxygen at high pressure. The lime is not consumed, though it may be partly melted, and the same lime may be used over and over again. A modern and equally familiar example is the incandescent gas-lamp on the Welsbach principle. In this case the glowing solid takes the form of a "mantle" composed of the oxides of thorium and cerium, substances which resemble lime. Both in the lime-light and the Welsbach light the flame is the non-luminous flame of the bunsen burner; all the light comes from the glowing solid. It is obvious that a mantle may be fitted to a spirit-lamp or any other with a non-luminous, smokeless flame; also that acetylene or other gas may be used instead of coal-gas, as, indeed, compressed hydrogen is used in lantern work.

Returning now to a common oil-lamp, it is obvious that such a lamp requires a vessel or oil can and a wick. The ancient Roman lamps had nothing more—some threads dipping into a dish filled with oil. Pupils may make lamps for themselves after this primitive fashion. Take a small bottle full of sweet oil (rape or colza are its other names); try to ignite the oil directly by a burning match. Now insert some loose cotton threads, wetting them thoroughly with the oil, and light again. A common form of simple hand-lamp took the teapot shape: the spout held the wick, while fresh oil was fed by the lid, and the handle, of course, was on the other side, just as in a teapot. The miner's lamp is much the same to-day—a tin pot with a hook or handle at one side, and a spout with wick at the other, and the miner keeps pulling up fresh wick or pushes it up with a pin when needed.

The first improvement is clearly to regulate the wick without opening the lamp, and this is done by making the wick into a flat, uniform ribbon, which passes over the teeth of a wheel turned by a handle outside the lamp. A more important thing is the air supply. In order to get plenty of air a chimney is introduced, so as to increase the natural draught; two wicks are placed with their faces parallel, so as to get a central current of air as well as the usual side supply. The wick may be woven into a hollow cylinder, giving an Argand oil-lamp with a central air supply; the flame may be made to assume a globular instead of a cylindrical shape by interposing a small metal table at its base in an Argand burner; lastly, by introducing the "regenerative" principle, the waste heat of the lamp may be utilised to heat the air which is intended for combustion. All these points may be seen in any good modern paraffin-lamp.

In table-lamps the light is generally pretty high, so as to illuminate a wider area. This means that the lamp must have a heavy base, otherwise it will be top heavy, and fall on slight provocation. Further, since accidents will happen, etc., a good "safety" lamp should be provided with some means of self-extinction in the event of a fall; and all lamps should, of course, have appliances for trimming the wick and extinguishing the light without the necessity of opening the combustion chamber. The oil chamber of a paraffin-lamp should be of glass, so as to

let its owner see when the oil is getting low. It is generally forgotten that the seemingly empty space above the oil is filled with oil-vapour, generally of a very inflammable kind, especially with foreign oils, and that every precaution should be taken to keep this oil-can cool—another reason for using glass instead of metal.

Now take the burner of any paraffin-lamp and look up the inside. It is bridged by a piece of brass gauze, or a perforated brass plate, or something of the kind. Examine a common gas-burner, and there will be found a similar piece of gauze. What is the use of this? To answer that question, let us leave paraffin-lamps alone for a little, and study the structure of a flame as seen in a candle, rat-tail gas-burner, bunsen burner, or simple oil lamp; preferably a bunsen burner, for the ease with which the gas supply can be regulated.

Close the air-holes and light the burner, turning down the gas to get a steady flame. Observe the shape of the flame, and where it is most and least luminous. Notice the outer fringe of blue near the bottom, the dark central core, the zone of greatest whiteness, the zone of yellow flickering light accompanied by smoke. Hold a wooden match across the dark core: it is charred at the edges of the flame, but untouched at the centre. Take some stiff white paper, and by means of this take cross-sections of the flame, from bottom to top, observing the central hole corresponding to the dark core. These sections show very well on white cardboard, and are more typical and also more easily got when the air-holes are opened. Note by the way the presence of soot, showing that the gas is being imperfectly burned. Now pass one end of a glass tube into the centre of the dark core of gas, and hold the other end up slantwise, then apply a lighted match. A small jet of gas burns at the upper end, showing that the dark core consists of unburnt gas. Now open the air-holes, and observe the absence of luminosity and also of smoke, but the great increase of heat, as shown by the rapid charring of the cards in making cross-sections of the flame. Increase the air supply, either by putting on a longer tube to the burner, so as to increase the draught and mix the gases better, or by employing forced draught; a common mouth blowpipe will serve very well to illustrate the latter point. Here the flame is still less luminous, but intensely hot: the combustion is perfect, and there is no central core of unburnt gas; indeed, there is now an excess of air. This principle is seen to perfection in the "mixing jet" of a magic-lantern, as opposed to the common "blow-through" jet, which is just the blowpipe over again.

So far we have got the combustible substance, gas or oil, and the supporter of combustion, air or oxygen. But a third factor enters into the calculation—the temperature at which that particular gas or oil burns. Take a square of wire gauze and press it down upon a bunsen flame. The flame is flattened out a bit, but refuses to pass through the gauze at first, giving a good view of its cool and hollow interior; for the gauze gets red-hot in a ring, leaving the centre fairly cool. Hold the gauze in the flame for a while, and the flame will pass through quite easily. Turn out the gas, hold the gauze an inch above the burner, then turn on the gas and light it *above* the gauze. This shows that the gas has no difficulty in passing through gauze, though the flame has. Repeat this experiment, but light the gas *below* the gauze. In both cases the flame passes through the gauze when the latter gets red-hot. Now turn out the gas and place the gauze on the top of the burner, then turn on the gas and light it. Lift the gauze cautiously, and with it the flame, and continue lifting till the flame strikes through. All these experiments show that a certain temperature is needed before coal-gas burns in air. All metals are good conductors of heat, and the interposition of a screen of wire gauze withdraws some of the heat of combustion, so that flame becomes impossible. When, however, the gauze itself gets heated up to that pitch, combustion proceeds as usual, and the flame reappears. At this stage show and explain the Davy safety-lamp, and especially its limitations, using a current of coal-gas from the mains to act as a "blower" of fire-damp. The Davy lamp was intended not to permit a miner to work in a "fiery" atmosphere, but simply to show him the presence of fire-damp, and therefore warn him to retire.

One more experiment with a bunsen burner leads back to paraffin-lamps. Open the air-holes and light the bunsen; then slowly turn down the gas. When the gas is pretty low, it suddenly "lights back"—that is to say, there is a slight explosion, and the flame travels down to the bottom of the burner, where it burns at the little exit pipe, producing among other things the poisonous gas acetylene. Now repeat this experiment, first laying a small piece of wire gauze across the mouth of the burner, or, better still, inserting it into the tube, as is done in a common gas burner. Turn down the gas as before: the flame no longer "lights back," since it cannot pass the wire gauze.

Think for a moment what would happen if no such gauze were inserted in the burner of a paraffin-lamp. The flame would travel down the wick to the oil-chamber below, and ignite the mixed mass of air and oil-vapour, and finally the oil itself. Not only does this screen prevent "lighting back," but it prevents a more dangerous accident. Paraffin-oil vapour is continually ascending through this screen, and when a "low-flash" oil is used, this vapour may take fire in the combustion chamber, with the possible result of cracking the chimney. No flame, however, can pass through the gauze to the reservoir of oil below, and thus a more serious explosion is avoided. It is exactly like the small explosion within the Davy lamp, which reveals the presence of fire-damp, but prevents any extension of the explosion to the fire-damp in the mine.

This leads, finally, to the subject of "flash-point." Place a tablespoonful of paraffin oil in a small basin, supported over a spirit-lamp or bunsen by a stand and wire gauze, and begin to warm it, stirring all the while with a thermometer. From time to time, say every 5° of the thermometer, hold a lighted match over the basin. At a certain temperature the vapour will catch fire, and, of course, will kindle the oil below. This temperature is the "flash-point" of that particular oil as tested in an open vessel.

The modern "close" or Abel test follows the same lines. The oil is heated by a water-bath, but the oil itself is enclosed in a cup with a sliding lid, so arranged as to permit the introduction of a small flame at intervals. The legal limit for kerosene is 73° F., or 23° C., by the "close" test—a temperature which corresponds to 100° F., or 38° C., by the old-fashioned "open" test. This limit is far too low for safety, since in many badly-made lamps the temperature rises far higher. The cure is to use cooler and better ventilated lamps, or else to use oils of a higher flash-point. The Scotch burning oils rarely flash below 100° F., close test; those of the Broxburn Company, quoted last month, have flash-points ranging from 110° to 120° F. for petroline, up to 230° F. for marine sperm oil. The importance of this is apparent when it is remembered that a temperature of 80° F. in the shade is not uncommon in summer, in London especially, where the use of low-flash oils prevails to a great extent, with a corresponding preponderance of lamp accidents. These are hardly known in Scotland, where the native paraffin oils of high flash-point have a monopoly of the market.

Next month's article will deal with candles and matches.

Suggestions for the Care and Use of Petroleum Lamps.

(*Issued by the Secretary of State for the Home Department.*)

1. The wick should quite fill the wick-tube, without having to be squeezed into it.
2. Before using, the wick should be dried at the fire, and then immediately soaked with oil.
3. Wicks should be in lengths of not more than ten inches, and should always reach to the bottom of the oil container.
4. It is well to change the wick after two months' use.
5. See that the chimney of the lamp fits properly, and is held sufficiently tight, so as not to fall off when the lamp is used.
6. When a new wick or chimney is required, it is always advisable to take the burner to the shop, that it may be properly fitted.
7. The burner should be taken to pieces and thoroughly cleansed at least once a month, and all burnt pieces of wick, dead flies, dirt, etc., should be carefully removed.
8. Never refill the lamp when it is alight, or near a fire or other light.
9. After filling, see that the burner is properly fixed on, and if there is a side filling-hole, be careful to screw in the plug.
10. Before lighting, remove the burnt crust of the wick.
11. Be careful not to spill oil in filling, and if any is spilt on the lamp, to wipe it off.
12. Before lighting, see that the slit in the cone of the burner is exactly over the wick-tube, so that the flame will not touch the metal.
13. When first lit, the wick should be partially turned down, and then gradually raised, but not so as to smoke. When the edge of the flame is orange-coloured, the lamp is not burning properly, and the burner should be examined.
14. Do not continue to burn the oil until it is completely exhausted. It is best to keep the lamp well filled.
15. Lamps which have no extinguisher should be put out as follows:—The wick should be turned down until there is only a small flickering flame, care being taken not to turn down so far that the wick falls into the oil container. The small flame may be extinguished by placing a piece of flat tin or card on the top of the chimney, or by blowing across the top of the chimney. Never blow down the chimney.
16. Never use a lamp which is broken or in any way out of order, or a chimney which is cracked. If any part comes loose, or is out of shape, or defective, it should be taken to a lamp shop to be repaired.
17. Always place the lamp in a secure place and on a level surface, and never on a rickety table, or in any position where it could be easily upset. Hanging lamps should not be put on insecure nails in the wall.
18. Table lamps should not be carried about more than is necessary, and nothing else should be carried at the same time. Heavy lamps should be carried in both hands. The greater number of lamp accidents have been caused by dropping a lamp while it was being carried.
19. Lamps should not be turned down except for the purpose of putting them out. If turned low the oil is apt to be unduly heated.
20. Should a person's clothes become ignited, the flames should be smothered with a hearthrug, blanket, woollen tablecloth, or wet towel.
21. NEVER POUR OIL ON A FIRE.

WHITEHALL, *November 1, 1901.*

THE NEW "OVERLAND ROUTE" TO INDIA.

The Original Overland Route.—In 1842 the Peninsular and Oriental Steamship Company established their first regular service to Calcutta by way of the Isthmus of Suez. The company worked this route by sending a steamer from Southampton to Alexandria, transporting the passengers, mails, and merchandise across the isthmus, and then sending them in another steamer down the Red Sea and across the Indian Ocean to Calcutta. The journey from Alexandria to Suez was performed in three stages—first, by canal-boat from Alexandria to Atfeh, a distance of forty-eight miles, which took ten hours; next, a steamer ran up the Nile from Atfeh to Cairo, a distance of a hundred and twenty miles, in sixteen hours; lastly, a kind of omnibus performed the journey of ninety miles of sandy road from Cairo to Suez, taking about eighteen hours. In 1859 a railway was opened across the isthmus, and for a period of ten years it formed an important link in the overland route to India.

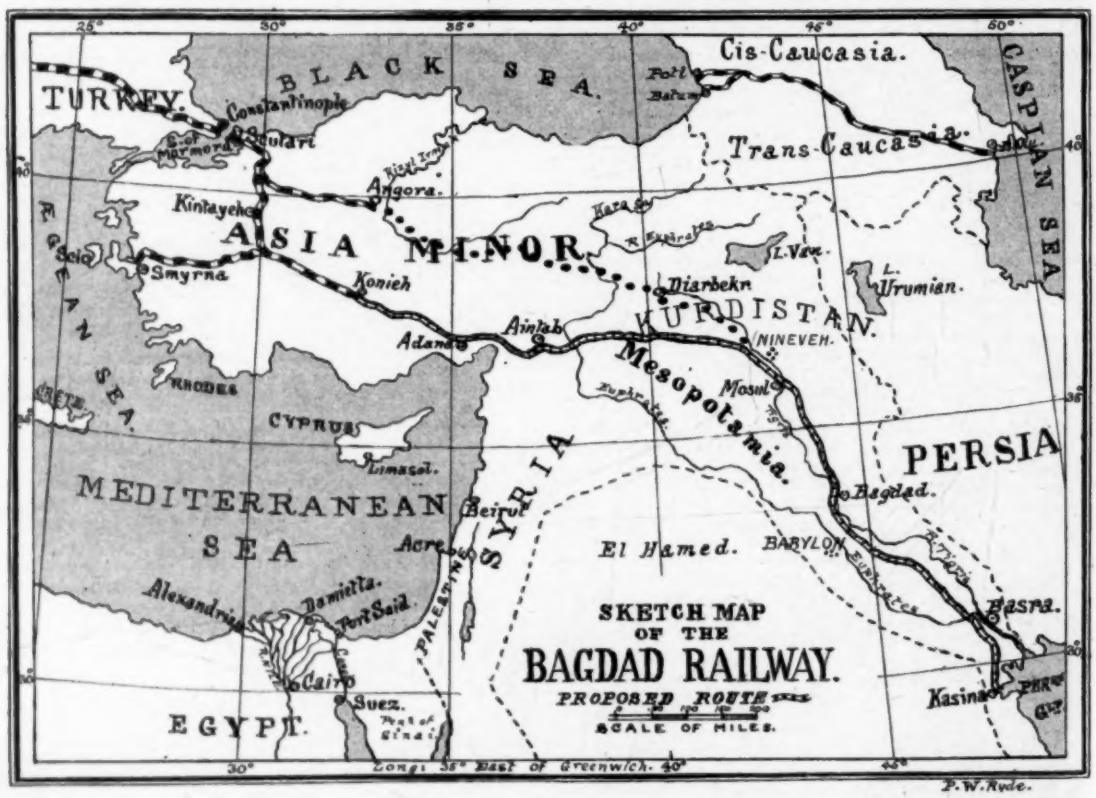
The Present Overland Route.—The Suez Canal was commenced in 1859, was opened for traffic in 1869, and has proved one of the most important channels of trade in the world. In the year 1900 no less than 3,441 vessels passed through the canal, 1,935 of them being British. Thus for a time there was no compulsory land journey, and the phrase "overland route" might have been displaced by a more correct title; but a new line was being made, by way of France and Italy, which necessitated boring through Mont Cenis. The Cenis Tunnel was commenced in 1857, and was finished in 1871. The first overland mail went by way of the Cenis Tunnel and Brindisi on January 5, 1872.

The Future Overland Route.—The route to India by way of Asia Minor and the Euphrates valley has long been considered as a possible alternative to that by way of Suez. So long ago as 1831 Captain Chesney surveyed the Euphrates valley, and proposed to establish a line of steamboats along that river; but the project, although declared practicable, came to nothing. In 1856 Sir W. Andrew and Captain Chesney again surveyed the valley, with the idea of building a railway line; but the scheme met with such opposition from the great powers of Europe that the Sultan refused his consent.

During recent years German capitalists have taken great interest in developing the natural resources of Asia Minor, and a German company, called the Anatolian Railway Company, obtained permission to construct a line from Angora down the valley of the Tigris, the route being that shown by the dotted line upon the map. The difficulties to be overcome were, however, so great that the scheme was given up.

Dr. Zander, the chairman of the Anatolian Company, then began the survey of the southern route from Konieh, and this scheme, first put forward in 1899, has just been accepted by the Ottoman Government. Starting from Konieh, which already has railway communication with Smyrna and Constantinople, the new line will cross the Taurus range and run to Adana, where it will enter upon a most difficult section. It will be carried across the Euphrates, will run due east to the valley of the Tigris, which river it will reach near to the ruins of Nineveh, and will then follow the valley of the Tigris to Bagdad, finally reaching the Persian Gulf at Basra, with a probable extension to the port of Kasina. The total cost of this new line has been estimated at £20,000,000, so that, as a scheme of giant enterprise, it is second only to the Trans-Siberian Railway itself.

In accordance with the arrangement just completed, the construction of the work must be commenced within three months, and the entire line must be finished within a period of eight years. There are 1,600 miles of line to be constructed; the whole is to be well laid, so that through express trains may run over it.



Value of the New Route.—The most important results expected from the new line are:—

1. A general development of the natural resources of the district through which the railway will pass.
2. Extension of the German colonies already planted in Asia Minor, with a consequent great impetus to German trade.
3. A new through route to India, with a possible saving of five or six days in the time of transit.

Passengers going to India by the Bagdad Railway would travel *viâ* Paris, Strasburg, Vienna, and Belgrade to Constantinople by the "Orient Express" route, and across the Bosphorus to Scutari; but whether or no the British mails will ever be carried by this line is a question to be decided after the scheme has been carried through and the route has proved to be safe and trustworthy for commercial purposes.

Political Considerations.—There is no opposition in England to the new route—indeed our Eastern merchants consider that it may assist our trade with the Far East; but there is considerable opposition from a portion of the German press, which asserts that the true interests of the German Empire lie at home in Europe, and that the establishment of this German company in Asia Minor may possibly lead in the future to undesirable and costly complications with Russia.

HOW TO COMPILE NOTES OF LESSONS.

BY T. HUDSON, HEAD-MASTER OF KEPLER BOARD SCHOOL, LEEDS.

VII.—HISTORY LESSON.

THE success or failure of the history lesson will mainly depend upon the degree with which the teacher manages to carry his scholars in imagination back to the far-off times of which he is speaking. If he succeeds in getting the children to conjure up mental images of the events, and live in imagination among the scenes depicted, he will have secured their interest, and history will be to them no longer a "dry" subject, but one in which they will delight.

No pains should be spared in assisting the scholars to form correct mental pictures of the events to be taught. Historical illustrations are of the utmost value. Even the small *Pictures from English History* (Books for the Bairns, Nos. 62 and 63) are of some value. *England's History as Pictured by Famous Painters* (Newnes) is better for placing in the scholars' hands or hanging up in the room for close inspection, though too small and indistinct for class demonstration. But by far the best aid to the teaching of history yet produced is a fine series of historical illustrations published by Messrs. E. J. Arnold and Son, Ltd., Leeds.* They are large, bold, and printed in colours, and are simply invaluable in teaching history. The block illustrating the following lesson is a reduced facsimile of No. 1 of the series. In it may be seen the dress and weapons, the tattoo marks on the skin, the war-chariot with knife attached to the wheel, a dead boar (the result of the chase), the white-robed Druid, a man returning from fishing with a coracle on his back, the cave in which the family dwells, and the Druidical stones in the distance.

Not only should pictorial illustrations be used, but if there is a stirring poem bearing upon the lesson it should be read. A lesson on the Magna Charta could be made more interesting by exhibiting a facsimile of that document. Messrs. Cassell and Co. publish one with their *Dictionary of English History*. They have supplied a copy of the Magna Charta gratis to several schools, and may possibly be inclined to entertain further applications, as they have sent a copy to the writer quite recently.

The map of the country should always be in front of the class during the history lesson, and the places named should be pointed to upon it.

Lastly, do not overcrowd your lesson with too many facts, but aim rather at giving a broad, picturesque outline of the events and their bearing upon succeeding times.

* See our advertisement columns.

NOTES OF A LESSON ON THE ROMAN OCCUPATION.

Standard IV.—Time: 40 minutes.—Requirements: A.L. historical chart of ancient British life; illustration of a Roman soldier; map of England and map of Europe.

Heads.	Matter.	Method.
The Ancient Britons.	1. The country now called England was formerly called *Britain.* 2. The inhabitants were called *Britons.* 3. About two thousand years ago they were little more than savages. 4. They were dressed chiefly in skins. 5. Had poor tools and weapons. 6. Lived on roots, fruits, and the chase. 7. Their homes were caves or huts made of twigs and mud.	1. Ask for ancient name, and when obtained write on B.B. 2. Write name. Get scholar to spell. Compare Britain. 3. See if any one can tell the meaning of 1902 A.D., and then compare with time of Christ's birth. 4–7. Exhibit the A.L. chart of ancient British life, and let scholars give most of these facts. Supply what they cannot get from the chart. (See accompanying illustration.)
The Romans.	1. Lived in Italy. Rome the capital. 2. A warlike people who had conquered the known world. 3. Soldiers, well drilled and well armed. 4. When in France (Gaul) they saw the white cliffs of Dover. 5. The Roman general sent over an army to conquer Britain.	1. Point on map of Europe. Compare name of race with name of capital. 2. Tell. 3. Show illustration of a Roman soldier. 4. Let scholars show on map of Europe where they would be when they saw Britain. 5. Tell; and in this lesson only one invasion will be mentioned.

Heads.	Matter.	Method.
The Landing.	1. The Britons were brave and warlike. 2. They opposed the landing of the Romans. 3. The Romans were finally victorious. 4. They settled in the south part of England at first.	1. } Tell, and ask what they would be likely to do. 2. } 3. Children infer from the advantages they possessed. 4. Scholars infer what part they would be likely to first settle in.
Incidents in the Occupation.	1. Romans drove the Britons to the north and west. 2. Among the mountains the Romans were not well able to follow. 3. When opportunity offered, the Britons attacked the Romans. 4. *Druids* fostered the spirit of insurrection. 5. Roman leader ordered their *massacre in Mona.* 6. *Boadicea* revolted, but was defeated.	1. Show on map of England. 2. Tell, and elicit reason. 3. Tell. 4. Show Druid on chart, and explain who the Druids were. 5. Show on map. Obtain modern name. 6. Briefly narrate.
Results of Occupation.	1. The Romans *made good roads*, so as to more easily get at the revolting Britons. 2. *Founded towns*, which at first were only military camps (*castra*)—Chester, Lancaster, Colchester. Also Lincoln, etc. (*colonia* = a colony). 3. Taught the Britons the *arts of peace*—namely, farming, weaving, pottery making, etc. 4. The Roman occupation was thus a good thing for Britain.	1. Point on map the chief Roman roads. 2. Write Latin word for camp and colony on B.B. Let scholars give towns with portions of names like "castra" and "colonia." 3. } Tell 3. Compare with previous mode of life, and 4. } let scholars judge whether the occupation was a good thing for Britain or not.

B.B. Sketch.

Britain. *Romans.*
Ancient Britons. *Rome.*
Druids—Mona.
Boadicea.
Roads—London to York.
,, London to Chester.
Castrum = a camp. *Colonia = a colony.*
Arts of peace—farming, weaving, pottery.

ILLUSTRATED COMPOSITION.

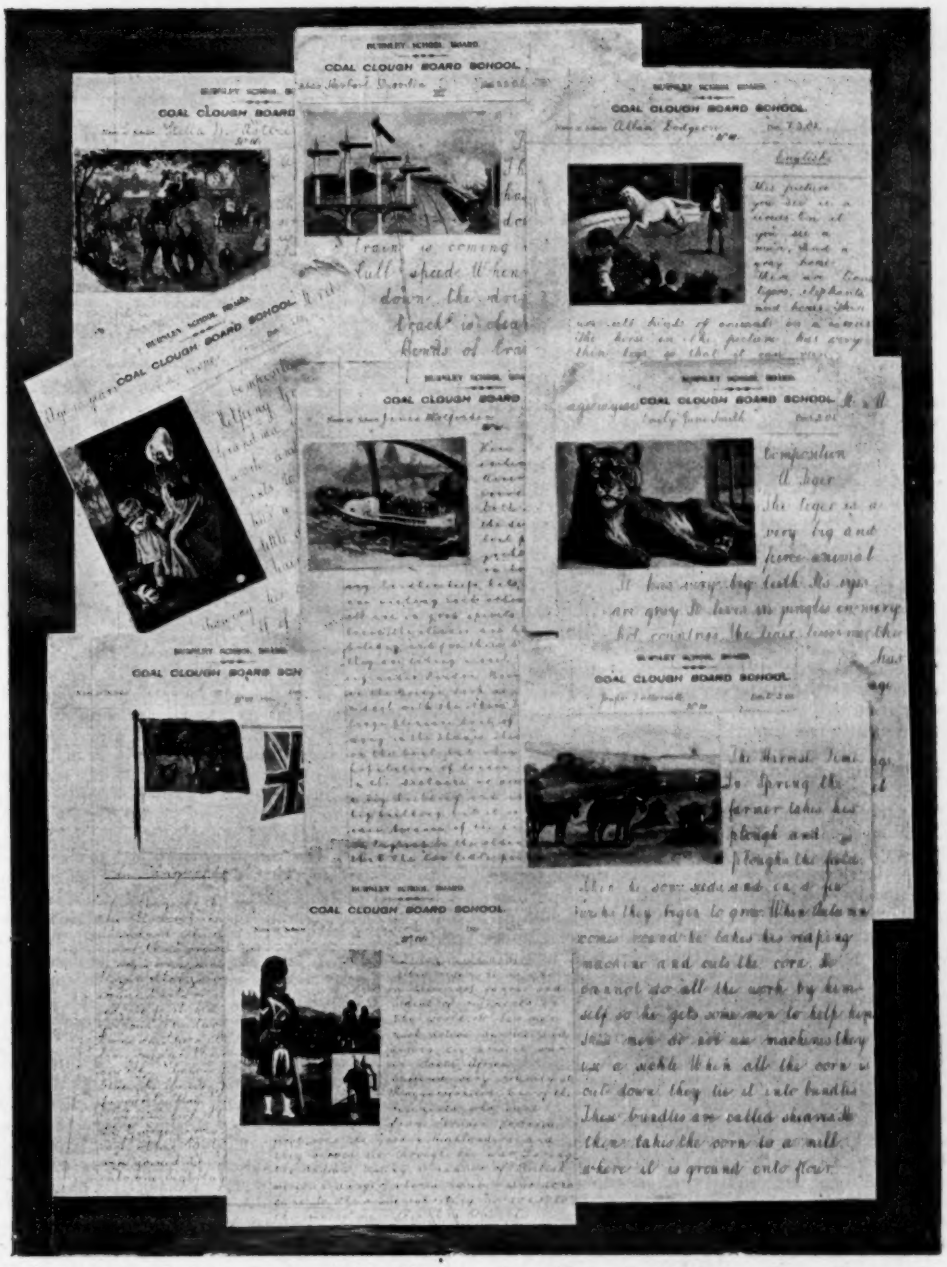
BY T. H. HARTLEY, HEAD-MASTER, COAL CLOUGH BOARD SCHOOL, BURNLEY.

WHENEVER the history of elementary schools comes to be written, the past ten years will stand out prominently as a period of great and beneficial changes in the work and methods of these national institutions.

Freedom of classification, the abolition of payment by results, the increased elasticity of the Code, and above all, the freer hand given to the teacher, have resulted in a great change in educational methods—a change which Mr. Holman, H.M. Inspector for this district, has described as almost a revolution. Despite the pessimism of some few reactionaries, these new methods have come to stay, and school life and school work are infinitely more varied, more intelligent, more interesting to scholar and teacher, and certainly much more calculated to give children a love of education for its own sake, and a greater desire to continue their studies, than was the case some years ago. But in this short paper my intention is merely to draw attention to a method of making the composition lesson more interesting and educative, and to show how the latent descriptive powers of children can be called into play. Those teachers who, like myself, visited the American Educational Exhibition, have no doubt been struck by the method of illustrating the composition exercises—by actual objects, by pictures, or by drawings—and also, like myself, returned home with a determination to introduce similar methods into their own schools. In my own school I can vouch for its success. Children whose composition was formerly weak and halting, artificial, stilted, and disjointed, now write with ease, and best of all naturally, on the particular picture or object in hand, and composition is now, as it ought always to be, one of the best subjects in school. Indeed, in popularity, it runs that pleasing and fascinating subject brushwork a close race for first place. Parents are delighted with the "essays" written by their children of seven and eight; and to my knowledge more than one of these illustrated compositions have received the dignity of a frame. At the "open day" for parents many exclamations of delight were heard as John's or Mary's illustrated essay came under notice.

If the picture lends itself to the weaving of a story, children are encouraged to draw upon their imagination, and wonderful are some of the productions of these young novelists. The boy or girl with a taste for reading comes out strongly in this exercise, and, given a suitable picture, such as an Indian or a shipwreck, will elaborate a story full of incident and adventure.

Until now, however, the difficulty has been to obtain a sufficiency of suitable pictures. When my stock of pictures—cut from old magazines, etc.—became exhausted, the children were asked to bring their own, but this method was not a success. In my difficulty I laid the matter before Messrs. T. Nelson and Sons, and they have now made arrangements to issue packets of *coloured* pictures suitable for this purpose at a cheap rate. The fact of the pictures being in colour adds immensely to their value and interest, as all teachers know how greatly colour is appreciated by children. The illustrations which accompany this article show the work of children between the ages of seven and twelve; and the



pictures used are some of the series issued by Messrs. Nelson. They are ready gummed on the back, so as to be easily affixed to the paper or book by the child. By the use of these pictures it is now possible to give each child in the class the same picture, which facilitates the work of marking. In conclusion, I would strongly urge any teacher who has not already adopted this method of aiding the composition lesson to give it a trial, and I feel confident that, like myself, he or she will be delighted with the result.

SIR JOHN DONNELLY.

THERE died on the same day as Professor Meiklejohn a man whose name is well known to teachers, for it appeared on all Science and Art certificates issued between 1884 and 1889, as the signature of the secretary to the Science and Art Department.

Sir John Donnelly was born in 1834, and being destined for a military career, he obtained a commission in the Royal Engineers, and served with distinction in the Crimean War. Having given proof of his knowledge of "the arts applied to war," he was allowed to try his hand at "the arts applied to peace," being appointed to an important post at South Kensington Museum, which led up to the secretaryship of the Science and Art Department. The Report of the Committee of the House of Commons appointed to investigate the methods and cost of administering the South Kensington Museum cast such reflections that the president and vice president had to come to the rescue. Sir John possessed many fine qualities, but his military training did not fit him for the administration of the Science and Art Department; and we are reminded of a conversation which took place between an English teacher and a German *confrère*, in which the latter complained of the hardness of the teacher's lot in the Fatherland, where teachers doing their military service were flogged by command of their officers. To this the Englishman replied, "Oh yes! but that is only corporal punishment; here the military afflict the teachers with Science Directories."

REGIONAL GEOGRAPHY.

BY JOAN BERENICE REYNOLDS, B.A.,

Gilchrist Travelling Student, 1897; Diploma in Geography, Oxford.

ALTHOUGH the teaching of geography still leaves much to be desired in our schools, yet when we turn to the past we cannot help recognising the great progress that has been made. In no direction perhaps is this improvement more strongly marked than in the change for the better that has taken place in the style of geographical text-books. The antiquated lists of facts, dry as dust in their bareness, are now clothed with descriptions, knit together by comparisons, elucidated by explanations, and often illustrated with pictures of many kinds.

Teachers, too, are increasingly realising the close causal connection between geographical phenomena, and therefore the mistake of treating them as isolated facts. The natural productions of a region, for instance, so obviously depend on certain topographical, geological, and climatic conditions, that few would now dream of discussing them without reference to these conditions, which obviously determine their situation and relative importance. Yet a short time ago it was no uncommon thing for pupils to be given lists of productions to learn by heart, without any hint as to the part of the country in which they originated, and the reason why they originated there rather than elsewhere.

The manufacture of maps showing the distributions of temperature, atmospheric pressure, winds, rainfall, vegetation, minerals, density of population, etc., has done much to bring out the relations existing between these phenomena—a matter that could hardly be properly appreciated as long as maps merely indicated the distribution of land and water and areas of different governmental systems.

We find that in order to emphasise this connection between the geographical phenomena of a district, and to give children mental pictures of the resultant scenery, teachers are increasingly paying attention to what is called "Regional Geography," the method according to which the land surface of the earth is apprehended as consisting of so many natural regions differing in the nature of the combination of forces which has produced them; and they try to give some idea both of the different kinds of scenery necessarily resultant, and of the influence of the varied geographical conditions on human development. Of course, this change of method is being reflected in geographical manuals and text-books. Already *Britain and the British Seas*, the first of a series of twelve volumes entitled "Regions of the World," has appeared; and it is stated that in each volume "there will be presented a picture of the physical features and conditions of a great natural area, with a discussion of the effects of these features on human societies." That it is easier to trace out the causal connection between various geographical phenomena, if a natural area is taken and treated fully, than if all the phenomena of the same type, occurring over a wide area, are considered together, will, I think, be admitted. For instance, if all the rivers of a country are treated before any of the productions grown in the valleys, or the towns situated on their banks, the frequent dependence of productions and towns on rivers is sure to be imperfectly realised without a great deal of repetition. River basins are often such important natural areas that they have received special consideration even in some text-books which have not recognised natural regions of other kinds, or consistently adopted the regional method of treating all countries.

In text-books where the geography of a country is only dealt with under such headings as capes, bays, islands, mountains, rivers, climate, etc., a child has often to turn from page to page in order to collect the scattered items of information which will enable him to build up a complete picture of the scenery of any particular portion of the country he is studying. He is, in fact, given mental pictures—too often, by the bye, names and not pictures—of the disconnected elements of many kinds of scenery; for example, a row of capes, a series of ranges, a variety of botanical specimens, a menagerie of tame and wild animals, etc., but never the finished view of any single landscape. By regional geography he is given pictures of scenes, very much as he would see them in reality if he travelled in the regions conceived.

Granted, then, that regional geography may advantageously supplement, and in parts even supplant, the older method of presenting geographical information, we have to decide on what principle we shall map out the natural regions of the world. On this matter I can lay down no hard and fast rules, for the age of the children to be taught, the special end in view, and the kind of country under consideration have all to be taken into account. It is clear, however, that the most important geographical information is that respecting climate and the relief of the earth's crust, because these are the geographical phenomena which most powerfully influence human life; and when once they are fully understood, what remains to be acquired is largely a matter of deductive reasoning. It is, therefore, with reference to these two classes of phenomena, but specially to the latter, that geographers have generally determined their regions for separate consideration. Again, since the relief of the land is largely determined by its geological structure, and vegetation is essentially dependent on climate, either vegetation or structure can be taken as a basis for the mapping of natural areas, but the latter more easily lends itself to scientific treatment than the former. Mr. Herbertson, in *Man and His Work*, describes and compares hot and frozen deserts, temperate and tropical forests and grass-lands, and indicates the different life of the inhabitants of these areas in accordance with their environments. In this book climate and vegetation determine most of the regions considered, but in the October number of *The Geographical Teacher* he indicates a possible division of the land surface of the world into four great regions, based mainly on structural considerations.

The number of regions into which a country will be divided of course greatly depends on the degree of detail in which we desire to study the country, but it is better to make broad divisions, and subdivide later, than to start by breaking up a country into a great number of small regions. Professor Davis, in his article in *The International Geography*, entitled "Regional Geography of the United States," divides that area into the following physical divisions:—The Atlantic coast plain, the newer and older Appalachian belts, the Allegheny plateau, the Ohio region, prairies, the south coastal plain, the great plain, the Rocky Mountains, the Colorado plateau, the Columbia plateau, the Basin ranges, and the Pacific ranges. Each of these regions he describes in detail, carefully correlating its commercial and historical geography with its physical aspect, and in some cases redividing an area into still smaller parts to show these relations more fully—for example, the Atlantic coast plain.

Dr. Mill, in his article on Great Britain in the same manual, determines its natural divisions with regard to their geological formation; but a yet broader view, based simply on the present relief of the land, is sufficient for many purposes. Mr. Mackinder, in lectures on the historical geography of Britain, has well realised for us the process by which the configuration of a country influences its history, by a study of the important highland and lowland regions of Great Britain. These are (1) the Highlands, which occupy the northern half of Scotland; (2) the Welsh Uplands; (3) the Central Uplands, a region roughly including the southern uplands of Scotland, the Cheviots, the Pennine Range, and the Cumbrian group; (4) the central plain of Scotland, which crosses the country diagonally; (5) the midland plain of England. The distinct characteristics of each of these areas and their relative situations are responsible for a good deal of British history. We can, for example, see in the central uplands, which divide the naturally fertile parts of England and Scotland, one of the causes of the long political separation of these countries.

The Rev. H. B. George, in a book entitled *The Relations of Geography and History*, enumerates the physical areas of Europe, which he thinks should ideally coincide with political divisions. These are the British Isles, the Scandinavian peninsula, the plain of Russia, the Germanic plain, France to the Cevennes and the water-parting between the Seine and Meuse, the plateau of Bohemia, Rhine-land, Rhone-land,

Danube-land, and the three southern peninsulas. It is interesting to notice the extent to which these areas now correspond to political divisions, or have done so at times in the past; and also to seek reasons for the departures from this scheme.

It would be easy to multiply lists of regions which have been selected by British and foreign geographers for special consideration, and to suggest alternatives; but since, as I stated before, each list can only be fairly judged when many variable circumstances are taken into consideration, all I propose to do is to call attention to the new method, and leave each teacher to determine for himself the areas best suited for his particular purpose.

There are, however, two other matters with reference to regional geography on which it may be well to make a few remarks, namely—(1) In face of the limited number of school hours at the disposal of the teacher of geography, to what extent will a regional treatment of a country answer in place of a survey in the old style? and (2) how can we best give children clear ideas of these regions?

The usual introductory headings for the discussion of a country are position, size, and boundaries, and these must be necessarily dealt with before we divide the land into regions. The next topic for consideration is often the coast-line, and this, I think, can generally be best treated in detail in connection with the various natural areas to which it belongs. In fact, it is impossible to understand either the physical appearance of a coast-line, or its commercial value to man, apart from a study of what the Germans would call its "Hinterland." So, after a general view of the shape and configuration of the country and of its climate, I think the districts might be determined and studied in that order which will best indicate their mutual relations.

Probably the best method to pursue in studying each of the regions is to obtain several maps of it, on different scales, and showing the distribution of different phenomena. By observation of these maps children can be led to find out the typical characteristics of a region; and their ideas should be corrected and supplemented by a study of pictures, and by reading extracts from standard works of travel, such as are supplied by the *Descriptive Geographies* edited by Mr. Herbertson. The use of pictures has been greatly facilitated by the development of photography, while in connection with tourist-travelling a wealth of literature of the Baedeker description has arisen, which is more or less regional in character. The regions therein treated may not be the areas we should select from a purely scientific point of view, though it is remarkable how closely excursion areas do often correspond to physical units; but there is at any rate little attempt to describe in detail all the hills of a country before any of the streams which rush down them, or the villages on their slopes.

In describing a region, it is well to encourage pupils to compare or contrast it with other areas; at the same time it is advisable that teachers should draw a distinction between similarities that are purely accidental and those which are due to the uniform action of the same forces on the same phenomena in different parts of the world. Some years ago a book written by the late Professor Meiklejohn was published, entitled *A New Geography on the Comparative Method*. I think that book has done a great deal of good by arousing general interest in the subject, and by assisting pupils to remember facts by associating them with other facts; at the same time it often fails to make the distinction to which I have alluded, and suffers in consequence. A great economy in teaching may be effected by means of judicious comparison, but it is possible for comparisons to mislead rather than enlighten.

With the description of the physical features of each district can be linked some account of its history, in so far as this has been evidently influenced by geographical conditions. How closely history is connected with geography has been ably illustrated in the second chapter of the *History of Civilisation*, by Buckle, and in the historical works of J. R. Green, not to mention the writings of many geographers on this fascinating topic. We must remember that in teaching children "applied geography," we are fitting them to become useful citizens of our empire; for there are many questions of foreign and colonial policy, problems relating to labour, our relations with aborigines, etc., that they can never hope to understand, or help rightly to solve, unless they see how these matters turn on geographical conditions, and can bring their geographical knowledge to bear in considering them.

A study of the natural productions of a district, and its supply of mechanical power, be it from wind, water, or fuel, leads to a consideration of the industries of that particular part, the distribution of population, and the sites of the chief towns. Children can perceive that the situations of various places have been determined by strategic as well as commercial considerations, but have to be told how powerful a factor the law of inertia has often been in causing towns to persist in situations no longer favourable.

And finally, when we have given a child a clear idea of each of the natural areas of a country, we have still to unite these together, so as to leave him with an impression of its social and political unity. The natural links of connection are the routes of communication, which generally follow "lines of least resistance," such as valleys and passes. So important a factor have passes proved in determining the direction of great routes, that though I do not believe in burdening children with numerical statistics, it is well for them to note the heights of some for purposes of comparison. For instance, the commercial importance of the Brenner Pass, probably from prehistoric times to the present, is largely due to its being the lowest pass in the Alps from those north of Genoa to those near Vienna. These routes radiate from and converge towards the important towns in the districts which they unite, and at the end of each route is a port or place through which the country comes into touch with the outside world, and where goods, people, and even ideas are exchanged. In tracing these routes, children will perceive how they often surround upland or relatively unproductive regions, and form a regular network over the more favoured plains. In this way the work can advantageously combine some revision with a view of the country as an organic whole.

I can hardly conclude this brief sketch of regional geography without reminding my readers that the *first* regions with which we must render children familiar are those they can tread with their own feet and see with their own eyes. We must seek at home for miniature forms of those far-off regions we shall later have to deal with; and if we can find at our doors hills, level fields, woods, and streams, children will easily construct from these some idea of mountains, prairies, forest areas, river basins, etc. If we are so unfortunately situated as not to be able to find even the smallest natural areas near our homes, it becomes a duty from time to time to go forth with the children and seek them until they are found.

INTERNATIONAL CORRESPONDENCE.

We have often in our columns recommended the plan of international correspondence as an aid to the acquisition of modern languages, apart from the collateral effect that must be produced in the direction of universal peace, and we are delighted to welcome the second number of *Comrades All*, with its French and German titles, *Annuaire de la Correspondance Interscolaire* and *Internationaler Schulerbriefwechsel*. Last year we suggested that contributions in Italian and Spanish might be included, and are glad to find that two pages have been devoted to Italy and Spain. Apparently the movement will soon extend to Holland; for although there is nothing said about exchange of letters, four young people with addresses in Amsterdam have signified their desire to exchange collections of stamps, picture cards, and wild flowers.

Comrades All is published at the office of the *Review of Reviews*, Norfolk Street, Strand, W.C.; and as the price is only eightpence, post free, we recommend our readers to procure a copy. The contents are very varied and interesting reading, including many letters that have been sent on the exchange system. When our readers see the simple rules which will enable them to enter into correspondence with an unknown friend with similar desires abroad, they will hasten to seize this opportunity of improving or renewing their acquaintance with a foreign language. We should particularly like to invite the heads of pupil-teacher centres and higher-grade schools to encourage their pupils to join the movement. No doubt arrangements could easily be made for a score or so of pupils in one English school to correspond with a similar number in a French or German school, and by sending the communications in one parcel a considerable saving might be effected in the postage.

THE PRINCIPAL FOREIGN HOLIDAY COURSES, 1902.

In our last issue, page 545, we gave information as to dates and subjects in connection with the above. We now, according to promise, provide our readers with the fullest particulars as to fees, fares, accommodation, etc. It should be mentioned that in addition to the Holiday Courses mentioned below, there are courses held at Villerville-sur-mer for the special study of phonetics, conversation, elocution, etc.; and also at Avila, Spain, for the study of Spanish language and literature. Each course is held from the first week in August until the 26th. Further information can be obtained on application to the Board of Education Library, Whitehall.

Where held.	Fees.	Return Fares from London, 1st Class Steamer, 2nd Class Railway.	Lowest Cost of "Pension" per Day.	For further information address:—
GERMANY:				
Greifswald.....	20 marks.....	*Vid* Hamburg, £3, 7s. **Vid* Hook of Holland, £5, 19s. 10d. (To Berlin—*Vid* Flushing, £4, 16s. 4d. *Vid* Hook of Holland, £4, 12s. 2d.	3 to 4 marks.....	Ferienkurse, Greifswald (Prof. Dr. Siebs).
Jena	Entrance, 5 marks. Each course of 12 lectures, 10 marks. Conversation classes (18 lessons and 6 excursions), 20 marks.	**Vid* Hook of Holland, £5, 7s. 3d.). (To Weimar—*Vid* Flushing, £4, 16s. 5d. *Vid* Hook of Holland, £4, 11s. 2d.)	As above	Frau Dr. Schnetger, Garteustr. 2.
Kiel.....	20 marks.....	*Vid* Flushing, £4, 12s. 8d. *Vid* Hook of Holland, £4, 8s. 5d. *Vid* Hamburg, £3, 10s. 6d.	2 marks to 2 marks 50 pfennigs.	Herr Nissen, Holtenauerstr. 38.
Marburg.....	30 marks for each course; or for both, 45 marks.	**Vid* Hook of Holland, £4, 3s. 8d. (To Coblence—*Vid* Flushing, £3, 8s. 5d. *Vid* Hook of Holland, £3, 3s. 11d.)	2 marks 50 pfennigs to 4 marks 50 pfennigs.	Herr A. C. Cocker, Villa Cranston; or W. G. Lipscomb, Esq., County High School, Isleworth.
SWITZERLAND:				
Geneva.....	40 francs, and 6 francs for special conversation classes and correction of written work.	*Vid* Calais, £6, 13s. 8d. *Vid* Antwerp, £6, 17s. 11d. *Vid* Dieppe, £5, 12s. 1d.	4 francs	Monsieur Charles Seitz, à l'Université.
Lausanne	40 francs.....	*Vid* Calais, £6, 5s. **Vid* Antwerp, £6, 12s. 10d. *Vid* Dieppe, £5, 2s. 4d.	4 francs (possibly 3 francs 50 cents).	Monsieur J. Bonnard, Avenue Davel 4, Lausanne.
Neuchâtel.....	25 francs.....	*Vid* Calais, £6, 3s. **Vid* Antwerp, £6, 4s. 10d. *Vid* Dieppe, £5, 0s. 6d.	4 francs	Monsieur P. Dessoulavy, Académie de Neuchâtel.
SPAIN:				
Santander	£2, 2s., if name is entered before July 15; otherwise £2, 5s.	London, Paris, Bordeaux, and Irun, £8.	4½-5 pesetas if engaged before end of May.	H. B. Garrod, Esq., 74 Gower St., London, W.C.
FRANCE:				
Tours	As above.....	(To Paris—*vid* Dieppe—3rd class, £1, 13s. 3d.) (Paris to Tours, about 10s.)	6 francs	As above.
Honfleur	As above.....	London to Southampton and Havre and Honfleur—1st, £2, 1s. 8d.; 2nd, £1, 11s. 8d.	As above.....	As above.
Paris.....	100 francs admits to both courses; 60 francs to all the lectures of a single course. Each lecture 1 franc. Each conversation class 50 centimes.	*Vid* Calais, £3, 12s. 10d. *Vid* Dieppe, £2, 11s. 3d.	As above.....	Monsieur le Secrétaire, L'Alliance Française, rue de Grenelle, 45.
Paris	25 francs per week.	As above.....	As above.....	Monsieur Louis Jadot, Université Hall, Boulevard Saint Michel, 95; or W. G. Lipscomb, Esq., County High School, Isleworth.
Grenoble	30 francs for the first six weeks and ten for each subsequent fortnight, or 50 francs for the whole course.	*Vid* Calais and Paris, £6; 16s. 6d. (Paris to Grenoble, £2.)	4 to 5 francs (possibly 3 francs 50 cents).	Monsieur Marcel-Reymond, 4 Place de la Constitution.
Nancy.....	1 franc for each lesson in either course (elementary or advanced) and 50 cents for conversational classes.	*Vid* Calais, £2, 14s. 6d. (single). (Paris to Nancy and back, £2, 3s.)	4 to 5 francs	Monsieur Laurent, rue Jeanne d'Arc, 30.
Caen.....	£1 for one week, £1, 12s. two, £2, 4s. three, or £3 for one month.	£1, 12s.....	4 to 6 francs	M. Lebonois, 7 rue Neuve-Bourg-l'Abbé; or Walter Robins, Esq., 9 Northbrook Road, Lee, S.E.

Note.—Programmes of most of these courses may be seen at the Board of Education Library, St. Stephen's House, Cannon Row, Whitehall, London, S.W.
* Special tourist tickets, three days' notice required, no luggage registration.

COMMERCIAL EDUCATION IN JAPAN.

THE calendar of the Tokio Higher Commercial School shows conclusively that, in the matter of commercial education, this country is not only far behind Germany and the United States, but is also at a great disadvantage when compared with Japan; for it is absolutely certain that in the whole of the United Kingdom there are not as many advanced day students of commercial subjects as there are in this single school at Tokio. The number of students attending this school is 503, of whom the youngest is sixteen years seven months, and the oldest twenty-six years three months, the average age being twenty. In addition to these 503 students, who are taking complete courses in commerce of an advanced character, there are 306 students studying foreign languages only, in a special department attached to the school. These are divided as follows:—For English, 88; French, 89; German, 88; Russian, 52; Spanish, 20; Chinese, 47; Korean, 12. The average age of these students is twenty-four. An examination of the syllabus of the school shows that the courses, which require attendance for thirty-two hours a week, are remarkably complete, and are of a much more advanced character than anything obtainable either in London or the higher commercial schools now open in Birmingham, Bristol, Liverpool, etc. In order to obtain the full diploma of the school, students must pass examinations of an advanced character in commercial correspondence and arithmetic, book-keeping, two foreign languages, the commercial aspects of mechanical engineering, a knowledge of commercial products, commercial and industrial geography and history, political economy, a knowledge of statistics, civil law, commercial law, the science and practice of commerce, gymnastics, and military drill. From the list given in the calendar, it is evident that the graduates of the school have no difficulty in obtaining positions in the Government offices, banks, insurance offices, railways, etc., while some are employed as teachers in the various commercial schools of Japan. The staff of the school consists of twenty-nine professors, twenty assistants, and ten clerks; the majority of these are Japanese, but Great Britain, the United States, Belgium, Italy, France, Germany, Russia, Spain, China, and Korea are all represented on the staff. The school is supported by the Japanese Government, and the site and buildings cost about £28,000. The annual fee is only £2, 10s. a year, but candidates for admission must, as a rule, be over seventeen years of age, and must pass examinations in Japanese, Chinese, moderately advanced mathematics, geography, drawing, physics, chemistry, English, and gymnastics. Following the wise example of the American Government, the Japanese Department of Education allows its teachers opportunities to absent themselves for prolonged vacations from time to time, in order that they may become acquainted with other countries; thus, at the time when the last calendar was printed, two teachers were absent in Europe and one in America.

The Practical Infant-School Teacher.

THE PLACE TO SPEND A HAPPY DAY.

THE title of this article is suggestive of Rosherville, that once popular resort of London 'Arries and 'Arriets, and now a thing of the past; though it is not of cockney youths and maidens we write, but of their little brothers and sisters. There are swarms of educational Roshervilles scattered over London—places where the days of our little ones are made bright and happy, where work and play are cunningly interwoven, where kind and skilful teachers minister daily with exemplary patience to the intellectual necessities of the youngest portion of the rising generation.

There is a vagabond element about my story, for it is both nameless and homeless. The misfortune is mine, but not the responsibility. Following instructions, I presented myself, while the school bell was still ringing, at one of those huge scholastic commonwealths or colonies which form some of the best landmarks of the London area. Having introduced myself and announced my mission in the form of a polite query, the head-mistress was perfectly willing to let me spend the day there, and to give me all assistance I might require for my "copy," but she preferred that no names should be published. To her, the personal or biographical element was unnecessary in such articles; what might be of interest to her fellow-teachers was, she thought, some description of the inner working of the school. Despite the reasons given, there was evidently a strong element of modesty in the matter, and a day spent in the company of this lady showed that to her an advertisement was rather a trial than a tonic.

There is much that is similar in the conduct of many of our infant schools—a likeness that is more prominent, perhaps, in methods of management than in methods of teaching; but even in the similarities of infant-school life there may be noticed variations which mark a greater or less degree of merit. This was very apparent in the assembly of the children, and in their short religious service. The children streamed in quietly from the classrooms, and took up their positions with as much precision as soldiers on parade, and with much less noise. The discipline was unmistakably good. Yet this is one of those "similarities;" we have seen it in other schools. There was, however, a distinctive element which lay in the tone or the atmosphere of the whole proceeding. The children, by their gait and manner, seemed more conscious, more morally or religiously sensitive of the devotional nature of the exercise in which they were about to share, than is usual. The hymn, the prayers, all bore the same characteristic. The children reflected the earnestness, the devotion, and the sincerity of the mistress, and it was evident, here at least, that the daily repetition of a school exercise had not deadened the religious element which should always dwell in it.

The first four classes were massed together, and the head-mistress proceeded to give a Scripture lesson. This arrangement set free four assistants, and so placed at liberty all the pupil teachers present, who came into the room. Such lessons occur twice a week, so that all the young teachers enjoy the privilege of hearing a model Scripture lesson at least once a week. New Testament lessons are generally given, the subject being on this morning the "Healing of the Sick of the Palsy." The lesson was a masterpiece of teaching—simple in its language, interesting in its treatment, and practical in its application. Considering the tender age of the congregation, the attention was most skilfully maintained, and the short oral examination showed that class intelligence lagged but little behind class attention. The thought occurred to us that the lesson might have been repeated with untold advantage to a number of our well-meaning but very amateurish Sunday-school teachers.

After a short nature lesson, "Number" followed next on the time-table; so we pass through the hall, down a long passage, and find the babies located at the east end of the building. There are about sixty children, all seated in new little desks. The kindergarten method is obviously employed, for sticks are being distributed. The opportunity is seized to elicit the opinion of the head-teacher on Froebel's methods.

She herself holds a first-class kindergarten certificate from Miss Bishop, and all the assistants possess certificates of some kind or other. Like many of her colleagues under the London Board, she has kept herself well posted in kindergarten developments. Neither in kindergarten teaching nor in any other branches of the school work does the mere "mechanic" find favour in her eyes. A knowledge of kindergarten methods is only half the battle—and the least half. For effective teaching, for the production of those educative results which are the prime aim of the system, there must be some knowledge of the main principles underlying the gifts and occupations. However the knowledge may be acquired, whether by reading or observation, or by both, the teacher who has some knowledge of the growth and order of development in child nature is, all other things being equal, the more desirable and the more *educative* teacher. Even the pupil teachers are not excepted. If they are old enough to teach the subject, they are old enough to read about it, to think about it, and to try to grasp a few of the main truths of child-life on which the system is built. It is merely a question of selection and gradation. The young teacher is not refused instruction in the early truths of arithmetic because the theorems of the higher mathematics lie beyond his understanding. Theory and practice are interwoven, and can only be separated at a mutual loss. The Code is a strangely inconsistent document. It implies or prescribes model lessons for the pupil teachers, and so provides very properly for the imitative element. It also prescribes criticism lessons, and if the criticism goes beyond the imperative or dogmatic stage, it implies also some knowledge of the more obvious reasons why certain things should be done or not done, and why they should be done in any particular way. These reasons rest on fundamental truths, and if mere monkey methods in education are to be avoided, such truths should be gradually acquired in a popular form by the young teacher. Neither the teaching nor the teacher is improved by disregarding them. The head-mistress was evidently not in sympathy with the latest tendency of the Board of Education in its regulation for wiping out much of the technical element in the training of our young teachers.

Froebel, however, has no blind disciple in her. Here again, like many of her colleagues, she differs from him in many respects, and thinks she ought to. There is no

crystallisation, even in kindergarten. The principles were admitted to be good, but freedom was required in their application; hence Froebel is not looked upon as a sole guide. It is sometimes alleged that the system leads to desultory teaching, but she had had no such experience herself. Such a result could be due only to the teacher, and not to the system.

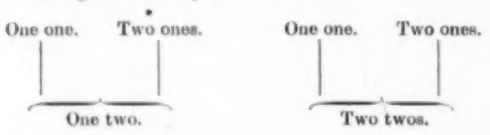
Meantime the "Number" lesson had been progressing with the babies. Each baby had four sticks, and the teacher was demonstrating little additions with them. No symbol was given until the children had thoroughly assimilated the idea. In the next class numbers were being studied up to eight, and bricks were being used. The bricks are especially good, because they lend themselves readily to the little operations which the simple rules of arithmetic permit to that integer. In the next room the children look particularly happy as they manipulate their bright-coloured skittles. Is there any reason why skittles should produce brighter eyes and merrier faces than bricks? Does the added element of colour account for this? Is it a question of association? Would heredity count for anything in such a case? Do the bricks suggest work, and the skittles play? Or what is it? The head-mistress calmly suggests that probably we have projected some adult experiences into the matter, and that she had not noticed the difference referred to. We changed the subject, but we still believe in that difference.

In the class above there were neither skittles, beads, bricks, nor sticks. Life evidently is not all skittles even in an infant school. So far as number is concerned, the dividing line runs between these two classes. Here the transition is made from the concrete to the abstract. Hitherto the little ones have had their arithmetic diluted with toys; now they have to take it neat. Work and play are divorced, but still remain on good terms; for skittles, beads, etc., continue to pay occasional visits to help the weaker members to cross the Rubicon; for do not they build the bridge to carry the weaklings over? Like doctors, they are called in for sick cases only. The pleasure of play is gone, and it is an interesting problem how far the growing sense of power and acquisition compensates. A wider field is given, for they rise from the skittle limit of twelve to the greater range of a score. But those who find the course too severe go only as far as they can. It is the fate of all progressive movements to drop stragglers by the way.

The second class deals with numbers up to fifty, while the first class has all the advantage that skilful and earnest teachers can extract from Scheme B. In fact this scheme is the basis of the work throughout all the classes.

To revert to the skittles. Perhaps the game as played by the children might interest some of your readers. There are more children than skittles, so the principle of selection has to be exercised. The lesson thus degenerates into one of demonstration and observation, instead of general manipulation; and without going into the economics of the question, we think the limited supply a misfortune. Large skittles for class demonstration, and toy skittles for each child, would be an improvement. The class would then be converted from a mere passive audience to active performers.

Some skittles are set up in front of the class, on the school table. Each young face shows an anxious expectancy that the teacher's choice may fall on him (or her), and the expressions rapidly change when the choice is made. The lucky boy selected walks out briskly with a joyous face, whilst the others show a shade of disappointment. How many groups of two can the young demonstrator form from the ten skittles? The skittles were then arranged as follows, and touching them he says,—



And so on.

In this way the analysis of each number up to ten is thoroughly learned and *realised*. After the skittles comes the blackboard—the work being graphically arranged to correspond with the skittles.

The recreation interval has arrived, and the pleasures of anticipation beam in every eye. Organised play is good, and is enjoyed; but the free, unfettered play of the playground is the natural choice of the children, and their love of it probably, in all healthy cases, transcends everything. Despite the many attractions of a good modern infant school, its most popular side is the outside; and child nature would not be true to itself were it otherwise.

We stand and chat with the mistress, and by an easy transition proceed from free games to the kindergarten games. How far does the element of play enter into them? Is the word "games" synonymous with play? Some teachers do not think the games playful at all, asserting that the drill element is too pronounced. It is merely a question of terms—of definition. The mistress states that she knows very little about games, although she has fallen a tame victim to the popular craze for ping-pong; but the difference seems to be that in play there is self-regulated movement, while in drill the movements are directed by another: the one is the movement of choice, the other of command. In this sense the games are drill pure and simple. Perhaps this explains the suggestion from some quarter that games should take the place of drill. Games can be connected with lessons, can lend themselves to the modern gospel of co-ordination, and so are of much greater value than drill. They always embrace some experience of child life, and they are good for organised expression of thought. But they have their weak side under what may be called general conditions. They lack variety, and need supplementing. The pleasure element is sometimes made subservient, so far as the movements are concerned, to the training element. They are limited in their application and in their value somewhat by the small size and cramped arrangement of most classrooms. The result is that some of them can be given only in the hall. They are valuable, nevertheless, and with improved buildings will become more so. There is room, however, both for them and for drill, for each has its own particular purpose to serve. They have a common property, in so far as each affords physical training; but beyond this they differ. The training chiefly imparted by the game is mental, that given by drill is volitional, and so the two in some degree may be said to be complementary.

The noise of the playground ceases; the parade element is again seen as the children fall into line in their respective companies or classes, and an orderly procession files back into the school. Soon all the classes are busy with reading lessons, and the children are struggling with the anomalies of English phonography and orthography. The babies have previously learnt the sounds of the letters, and they are now forming letters with strips. For a change giant letter cards are sometimes used, and many of those little devices common to most of our infant schools are used to give interest in the work. The upper babies are dealing with words of two letters, with the occasional entry of a three-letter word. The grading is very similar to that seen in some other schools, and needs no special comment here. The upper division of the fourth class are busy with a primer. They are in the full enjoyment of their first book; they have stepped on to the threshold of their country's literature. The odd English of the primer does not cause them surprise, and rarely tickles their risibility. Word-building is a great aid, and an economic force in the teaching of reading, but you pay too dear for your whistle when it demands as a price the inclusion of vulgarities and unrealities. The English language is rich enough, and child experience wide enough, to avoid such weaknesses, and many of our best primers have recognised this by keeping such stuff out of their pages.

The question as to the age at which children should begin with books is a disputed one. Here the children of the upper division of the fourth class are the first to have them, and it seems to be a common judgment and recognised practice of our best infant mistresses to begin about this period. The wider question of the best time for beginning to teach reading at all is a still more disputed one. Froebel keeps

children from reading till six, and very few mistresses are Froebellian on that point. It is a great mistake to let children go on to the age of six or seven without the rudiments of the three R's, and especially in reading. Children love reading; they are anxious and proud to reach the book stage, and so direct instruction should be given from the first. The reading here is very good—much above the average. For such young scholars it is both expressive and intelligent, and apparently thoroughly enjoyed by the children. After the primer stage is reached there is a large element of the Look-and-say method, and a fair amount of pattern-reading.

We remember reading a few years ago a Departmental circular on reading, in which, among other things, pattern-reading came in for little official appreciation. It was practically written down, and the circular, like all such documents, was evidently meant to set the fashion to the English primary school world. Totally disagreeing with the principle laid down on this point, it was with some degree of pleasure that we recognised a practical faith in the value of this branch of teaching. Reading is an art, says the mistress, and imitation is a strong factor in the early stages of art; hence we pattern-read. Imitation is always at work, consciously or unconsciously, during the waking hours of the child, and the pattern of the home and the street is rarely good; hence it is the function of the school to supply a better one. We may pattern too little or too much, but the latter is the less evil of the two. Pattern-reading is absolutely essential if the monotonous vocal drone of unillumined effort is to give place to that light and shade, that modulation, which makes speaking or reading not only endurable, but even pleasurable. The light and shade may be too strong, the emphasis may be exaggerated, but these are faults that practice soon corrects. So argues the mistress; but then she had taught thousands of children to read, whereas the man who drew up that circular had probably never taught a class of beginners in his life.

By the time the second class is reached the children read quite easily. If exaggerated emphasis or strained expression are feared as products of pattern-reading, the mind can be set at rest, for there is apparently no trace of it in this class. The reading is expressive but natural. Both pronunciation and enunciation are good, whilst the articulation is correct. The readers in use in the top classes are little story books with continuous narrative, a little elementary humour, and the interest of plot, but utterly oblivious of word-building. There is no mistake about the value of such books: they create a love for reading which lies beyond the power of the ordinary word-building type with its strings of gibberish. Word-building is always utilised, but it is not idolised. It receives all requisite attention as a valuable means or aid, but the sense of proportion in connection with it is not lost, as is the case in some schools.

Writing proper is not taught until the fourth class is reached. In the first attempts writing is an occupation rather than anything else. In the earlier stages of child life it represents nothing in the child's mind, it is asserted; and this is used as an argument for its postponement. It is not quite so here. Sand-trays are produced, and the babies commence their art instruction by a few simple lines traced in the sand. Some of them seem to find more pleasure in shaking up the sand than in any artistic effort, and it is comprehensible: there is more movement and more activity, and that part of the process approximates to real play. Art is a matter of temperament and endowment, and the vigorous way in which some of the young artists set about their task revealed temperaments that might be classed as energetic rather than as artistic. How happy they all seem with their trays!

We pass to the class above the baby room, and find the children here also writing in sand with their little fat forefingers. The sand artists had reached the advanced stage of elementary forms and easy letters, both capital and small and outline figures of common objects. We noticed that the back view of a cat was a special favourite: the children were drawing it from memory, the memory lesson always following a "copy" lesson. No figure delights them so much as pussy, who embodies so many associations of their young lives. We pass onwards and upwards to the next class, who are copying some of the *easy* letters of the alphabet. They are working on paper with pencil, and are obviously proud of the fact. Health considerations have doomed the slates, and so have led to an educational improvement. We did not enter into the advantages and disadvantages of slates *versus* paper, but there was unanimity as to the improvement wrought by the elimination of slates.

On the whole, there was nothing special about the writing. It was marked by very careful gradation, as in many other schools, finishing in the top class with neat transcription in copy-books ruled as slates. The first and second classes write in ink, and in all cases the children are made to sit in hygienic positions. The mistress attached so much importance to a healthy position for the writing lessons, that she secured necessary structural alterations in the rooms for this purpose. It is hoped and believed that now most infant mistresses are equally careful in waging war against twisted spines, perverted vision, round shoulders, incipient indigestion, and the other physical evils arising from improper positions in the writing lessons. No special system is taught. Legibility seems the chief aim. The writin was bold, round, and rather large, upright rather than sloping, and giving promise of a good legible business hand.

The object lessons are arranged on educational lines, and afford a centre of co-ordination sufficient to satisfy the most enthusiastic apostle of this principle. As much as possible, they are made to dovetail with the varied occupations and the seasons of the year. Natural objects are thus obtained, and so the object is studied in the original. If the lesson be on a flower, most of the children bring flowers, some even several specimens, and so supply those who are less favoured by circumstances, or are less enthusiastic. In a subsequent lesson the flower is drawn in rough outline, or is pricked and sewn, some of the specimens being very creditably drawn. The drawings are coloured by reference to the flower itself. The best are then mounted on black or pink mounts, and hung round the classroom, as trophies of budding artistic skill. A success of this kind may be looked upon as a substitute for the honour board of the upper departments, and there is no doubt that the practice brings the same lasting pleasure and the same stimulus to these tender aspirants.

In the first class the object lesson throws out still more "co-ordinates," and fastens itself, among others, on to the clay. The subject of the object lesson is afterwards modelled in clay, and the preliminary training of the mud-pie of the gutter now receives an artistic turn and guidance which leads to some very remarkable productions. The snowdrop, daffodil, tulip, oak leaf with acorn attached in cup, and a cup empty, and bird's nest with eggs, were among the specimens submitted to our view. All were well done, and some of the daffodils especially so. There was no touching up by the teacher, each object being the pure production of the child.

The drawing-book is also brought into play in this class. An object lesson had been given on the "bee," and drawings had been made of a bee, a beehive, cells, etc. In some of the lower classes it has already been noticed that pricking and sewing take the place of clay modelling and drawing, so that "co-ordination" is overlooked nowhere. Perfect freedom is given to the children to invent patterns, and it must be confessed that these juvenile designs would neither win a prize at an art exhibition, nor secure an award in a national competition; but the work was both educative and interesting: it was the product of their own little hands, and in some cases, perhaps, it was the germ of great potentialities. Who knows?

It is a proper transition from the general to the particular, and for that reason we have deferred any reference to nature lessons, although these fall early in the morning sessions three times a week. The school makes a speciality of these lessons, the mistress believing that their effect upon habit and taste in after years will be one of the best moral and artistic effects of infant-school training. The training element is not overlooked, but the present mental value of the work is not considered superior to the deferred moral and æsthetic value. To do something towards cul-

TIME-TABLE—INFANTS' DEPARTMENT.

MORNING.

Day.	Class.	9 to 9.15.	9.15 to 9.40.	9.40 to 9.55.	9.55 to 10.35.	10.35 to 10.50.	10.50 to 11.	11 to 11.30.	11.30 to 12.
MONDAY.	1.	ASSEMBLY AND PRAYERS.	Hymns.	Nature Less.	Arithmetic.	Play.	Word Building.	Reading.	Tonic Sol-fa.
	2.		,,	,,	,,	,,	,,	,,	Writing.
	3.		,,	,,	,,	,,	,,	,,	,,
	4.		,,	,,	,,	,,	,,	,,	Object Lesson.
	5.		,,	,,	Number.	,,	,,	,,	Writing.
	6.		,,	,,	,,	,,	,,	,,	,,
	7.		,,	,,	,,	,,	Recitation.	Alphabet & Sing.	B.B. Writing.
TUESDAY.	1.		Holy Scripture.	Mental Arith.	Arithmetic.	Play.	Word Building.	Reading.	Writing.
	2.		,,	,,	,,	,,	,,	,,	,,
	3.		,,	,,	,,	,,	,,	,,	Object Lesson.
	4.		,,	,,	,,	,,	,,	,,	,,
	5.		,,	,,	Number.	,,	,,	,,	,,
	6.		,,	,,	,,	,,	,,	,,	,,
	7.		,,	Counting.	,,	,,	B.B. Writing.	Alphabet.	,,
WEDNESDAY.	1.		Holy Scripture.	Nature Less.	Arithmetic.	Play.	Tables.	Reading.	Writing.
	2.		,,	,,	,,	,,	,,	,,	,,
	3.		,,	,,	,,	,,	Word Building.	,,	,,
	4.		,,	,,	,,	,,	,,	,,	,,
	5.		,,	Singing.	Number.	,,	,,	,,	,,
	6.		,,	,,	,,	,,	,,	,,	,,
	7.		,,	,,	,,	,,	Recitation.	Alphabet & Sing.	,,
THURSDAY.	1.		Holy Scripture.	Mental Arith.	Arithmetic.	Play.	Word Building.	Reading.	Writing.
	2.		,,	,,	,,	,,	,,	,,	,,
	3.		,,	,,	,,	,,	,,	,,	,,
	4.		,,	,,	,,	,,	,,	,,	,,
	5.		,,	,,	,,	,,	,,	,,	,,
	6.		,,	Singing.	Number.	,,	,,	,,	,,
	7.		,,	,,	,,	,,	Action Songs.	Alphabet & Sing.	,,
FRIDAY.	1.		Ten Command.	Nature, Re-	Arithmetic.	Play.	Word Building.	Reading.	Clay Modelling.
	2.		,,	citation, or	,,	,,	,,	,,	Object Lesson.
	3.		,,	Conversation	,,	,,	,,	,,	Writing.
	4.		,,	Lesson.	,,	,,	,,	,,	Drill.
	5.		,,	Tonic Sol-fa.	Number.	,,	,,	,,	Writing.
	6.		Lord's Prayer.	Singing.	,,	,,	,,	Alphabet.	,,
	7.		,,	,,	,,	,,	,,	,,	K.G. Game or Sing.

AFTERNOON.

Day.	Class.	2 to 2.35.	2.35 to 3.10.	3.10 to 3.25.	3.25 to 4.	4 to 4.20.
MONDAY.	1.	MARKING AND CLOSING REGISTERS. Needlework. Draw.	Num. and Drawing.	Play.	Number & Draw.	Singing.
	2.	,,	,,	,,	,,	Dismissal.
	3.	,,	Needlework & Draw.	,,	,,	,,
	4.	Emboss. & Pricking	Freearm Drawing.	,,	Writing.	,,
	5.	Stick Laying.	Drill.	,,	,,	,,
	6.	Sand Work.	Stick Laying.	,,	Conversa. Lesson.	,,
	7.	Letters.	Bead & Straw Thread.	,,	,,	,,
TUESDAY.	1.	Writing.	Object Lesson.	Play.	Geography.	Ment. Ar. or Tables.
	2.	,,	Drill.	,,	Object Lesson.	Dismissal.
	3.	Freehand Drawing.	Colour Work.	,,	Tonic Sol-fa.	,,
	4.	Freearm Drawing.	Kindergarten.	,,	,,	,,
	5.	K.G. Sewing.	K.G. Sewing.	,,	Writing.	,,
	6.	K.G. Occupation.	Needle Threading.	,,	K.G. Game in Hall.	,,
	7.	Colour Lesson.	Object Lesson.	,,	Game with Toys.	,,
WEDNESDAY.	1.	Knitting. Writing.	Knitting. Writing.	Play.	Drill.	Ment. Ar. or Tables.
	2.	Draw. & Col. Work.	Draw. & Colour Work.	,,	Tonic Sol-fa.	Dismissal.
	3.	Knitting. Drawing.	Knitting. Drawing.	,,	Object Lesson.	,,
	4.	Drawing. Sewing.	Drawing. Sewing.	,,	Writing. Sewing.	,,
	5.	Needlework. Draw.	Writ. & Needlework.	,,	Writ. Needlework.	,,
	6.	Gift III. K.G.	Reading.	,,	Draw. Sand Work.	,,
	7.	Letters.	K.G. Game in Hall.	,,	Fairy Tales.	,,
THURSDAY.	1.	Draw. & Col. Work.	Draw. & Colour Work.	Play.	Object Lesson.	Recitation.
	2.	Drawing. Knitting.	Drawing & Knitting.	,,	Clay Modelling.	Dismissal.
	3.	Clay Modelling.	Clay Modelling.	,,	Drill.	,,
	4.	Knitting. Writing.	Knitting. Writing.	,,	Reading.	,,
	5.	Colour Lesson.	K.G. Games.	,,	Object Lesson.	,,
	6.	Action Songs.	Needle Threading.	,,	,,	,,
	7.	Letter Cards.	Sand Work.	,,	Gift I. K.G.	,,
FRIDAY.	1.	Writing.	Reading.	Play.	Fairy Tales.	Dismissal.
	2.	,,	,,	,,	,,	,,
	3.	Tables.	Writing.	,,	,,	,,
	4.	Writing.	Reading.	,,	,,	,,
	5.	W. Build. or Read.	Writing. Recitation.	,,	,,	,,
	6.	Thread Laying.	Bead Stringing.	,,	K.G. Game.	,,
	7.	Letters.	K.G. Game.	,,	Fairy Tales.	,,

tivating a love for nature is an aspiration shared by many teachers, and it is one of the best aims of modern infant-school life.

By a touch of fancy we quit the school studio and enter the school conservatory. It is an artificial garden, tended and cared for by the children themselves. The element of personal interest is thus introduced, to the common benefit of teacher and taught. The seeds are sown by the children, and the plants are reared by them. Seedtime and harvest are not conventional; in fact they are a law unto themselves. There is a chronological or family element about them. Seeds are sown at recurring intervals, so as to show the different stages of growth. The sensuous effect is not nearly equal to that of a good cottage garden, nor is plant life as happy as that in the cottage soil; but the children are certainly more in love with their own than with any other garden, be it never so good. The hyacinth is showing its growth in a glass—a short life and a wet one; carrots and parsnips are following the bibulous example of the hyacinth; the onion is competing under equal conditions; while mustard and cress, oats and maize, deprived of their natural element, are struggling for existence in wet sawdust. There is little or no beauty in the programme for the child eye, but there is a world of interest. One glance is sufficient to reveal this. The beauty element is not forgotten, however; for in every room flowers are growing in pots, and on every table cut flowers are standing in vases provided by the teachers. The children supply most of these cut specimens, and—we became pensive. We remembered our own early days, and we wondered how many of the neighbouring private gardens were commandeered to keep up the supply; but we did not raise the question, and we still wonder.

The nature lessons are linked with the school recitation. The first class was doing Tennyson's "Brook," which the teacher was illustrating on the blackboard in coloured chalks. The power to sketch roughly and rapidly on the blackboard is a decided acquisition to a teacher, and the effect in this case was particularly happy. In a few minutes a suitable view was put on the blackboard illustrating the couplet—

> "And sparkle out among the fern,
> To bicker down the valley."

A previous drawing, or portion of the drawing, rather, was already on the blackboard when we reached the class, picturing out—

> "I come from haunts of coot and hern,
> I make a sudden sally."

Interest and effect grew with the growing sketch, as it hurried by thirty hills—only a few figured in the sketch—or slipped between the ridges. The twenty thorps and the half-hundred bridges were done in sample only; but when Philip's farm came on the scene, there was a bit of rough but very suggestive drawing, and the delight of the class was very pronounced. All these sketches are roughly reproduced in books from memory, or from imagination in rare cases, so that the poem becomes a reality and a memoritory fixture. The idea was good, the work was pleasing, but we thought that we saw difficulties ahead. The poem reveals the brook as a self-confessed chatterbox. "I chatter over stony ways," "I chatter, chatter, as I flow"—how is the chattering illustrated? It appears that Philip's farm is the terminus; the lesson goes no further. Besides, the mistress did not think such lines needed illustration. We wondered what she meant!

The school reports are uniformly excellent, and they embrace the judgments of about half a dozen inspectors; but another pen than ours shall write the concluding paragraph of this sketch, for we find the following reference to this school in the pages of a certain novel:—

"Let any one who wishes to know a new delight take a journey to X, and call at the infants' school.....In the very heart of this unpleasant district you may find one of the most hopeful and lovely sights that can be imagined. In that pretty school the children enjoy life to the full. You cannot stay half an hour amid the merry, orderly crowd without feeling that a good influence is at work all round you. I do not care for sentimental phrases, but I can only describe that delightful place by saying that it seems as though love were in the very air."

ELEMENTS OF READING.

EXAMPLE LESSON III.

BY C. M. A. COOMBS, L.L.A.

Apparatus.—Provide a tin (12″ by 8″) for each child, and one three times the size for the teacher. The sand is conveniently kept dry in a zinc bath. A wooden trowel and small brush and dust-pan will also be found very useful. The teacher's table should be low, with slanting top, having a ledge at the front edge against which to rest the tin.

Introduction.—Use the trowel to give a small portion of dry sand to each child. With a class of sixty children, this should only take about three minutes. The following little song will interest and amuse the children while sitting with hands hidden during the process of "sand-giving:"—

Tune—"*The Mulberry Tree.*"

Here's a tin and here's some sand,
And we are all a happy band;
We will work and we will play,
For we are good little children.

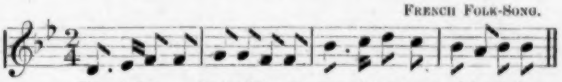
We will make some letters small,
And then say them one and all;
We will work and we will play,
For we are bright little children.

The children to get sand smooth and ready for work to a drill of this kind:—

1. Hands show.
2. Touch tin with both hands.
3. Shake tin.
4. Hands hide.

These lines will bring every child to attention:—

FRENCH FOLK-SONG.



N.B.—Peter Pointer (P.P.) is the first finger on right hand, and is the one which does all the work in the sand.

Lesson.—Children, we made a soldier letter the other day; let us do so again. Put P.P. at the top
I of the tin, and draw a standing up line. What is his name? Yes; and do you know he went out in the snow and caught cold in his tooth, and had a big bump on his face. Put P.P. at the top of letter 1;
P draw it round and bring it in at the middle so. What shall we call this poor letter? Yes; and poor letter P can only speak so softly with his lips. Look at mine and listen. Now you speak like letter P. (Children imitate teacher.) One day letter P fell down and got another bump, this time on his knees. Put P.P.
B on the middle here, and draw another bump down to his feet. This letter with two bumps is letter...? And what does letter B say to us? (Teacher draw attention to the difference between sounds of P and B.)

Shake tins. Hands hide.

Sing—"This is busy P.P.; Surely he's a double-jointer."

Proceed as above with a second series of letters to suit length of time given to the lesson.

Conclusion.—Pass tins *with* sand to ends of desks. Two boys come and take tins and sand away. Empty sand into zinc bath and put in cupboard. A third child get brush and dust-pan and sweep up any sand which may remain on desks.

The class standing to sing (tune as above)—

Now our reading lesson done,
Out to play we all can run;
For first we work and then we play,
If we are good little children.

WHERE THE JAM POTS GROW.

Introduction and Interlude.
KEY C.
Nev-er tell me of your bowers, That are full of weeds and flowers; Nev-er tell me of your mead-ows where the breez - es blow. Some-thing
Refrain.
fair - er far than these I can show you, if you please; 'Tis the jol - ly lit-tle cup-board where the jam pots grow. Where the
jam pots grow, Where the jam pots grow, Where the jel - ly - jol - ly, jel - ly - jol - ly jam pots grow; The

1 NEVER tell me of your bowers,
That are full of weeds and flowers;
Never tell me of your meadows where the breezes blow.
Something fairer far than these
I can show you, if you please;
'Tis the jolly little cupboard where the jam pots grow.
Refrain.—Where the jam pots grow,
Where the jam pots grow,
Where the jelly-jolly, jelly-jolly jam pots grow;
The fairest spot to me,
On the land or o'er the sea,
Is the jolly little cupboard where the jam pots grow.

2 There the golden peaches shine
In their syrup, clear and fine;
And the berries all are blushing with a red, red glow;
And the cherry and the plum
Seem to call us all to come
To the jolly little cupboard where the jam pots grow.—*Refrain.*

3 There the rosy apples stand,
With the peaches close at hand,
And the marmalades and jellies in a row, row, row;
So sing we with a will
Of the house, when all is still,
And the jolly little cupboard where the jam pots grow.—*Refrain.*

ACTIONS.

In verse 1 a sweep of the hands overhead will indicate the bowers; the weeds and flowers can be pointed out; the meadows may be indicated by extended arms, and the cupboard by hands held perpendicularly. The jam pots should be pointed out by one finger, in time to music; land and sea being denoted by slight movements of the hands. In the other verses, varied movements will be required to point out the different fruits as they are named by the little singers.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Principal of the Belvedere Pupil Teachers' Centre, First on Scholarship List; Author of "Scholarship School Management," "Building of the British Empire," etc.

SCHOLARSHIP EXAMINATION, 1902.
Fifth Month—May.

Work for the Month.

1. *Reading.*—*Quentin Durward*, chaps. xxiv.-xxviii. (For notes, see page 581.)

2. *Repetition.*—Ten or twelve lines per week.

3. *Teaching.*—The teaching of spelling and writing (chaps. v. and vi.), *Scholarship School Management.*

In the teaching of spelling, great attention must be given to two phases of the question. First, that spelling must be taught by the eye, and not by the ear; and secondly, that the principles of association must be followed, and words taught in a scientific and logical manner. In carrying out the former, writing will be found more efficacious than oral spelling; in the latter, every device of juxtaposition must be resorted to to impress the word on the mind. Word building, if properly graded and intelligently taught, is the best means of teaching the subject in the lower standards. Derivation and the use of prefixes and affixes is also of great importance, as teaching both spelling and meaning, and adding some interest to what easily becomes a dry lesson. Thus, if a root like the Latin *duco, ductum*, "I lead," be taken, the scholars are soon interested in seeing how many new words can be made from it by the use of prefixes and affixes. If the meaning of prefixes and affixes be known, the meaning of the new word can be easily deduced. For example, from the root *-duce* we may get *reduce, conduce, produce, introduce, seduce*, etc.; and then the abstract nouns formed from them—*reduction, conduction, production, introduction, seduction*, etc.; then adjectives like *reducible, conductive, productive, introductive, seductive*, etc. And so on. Intelligence is called into play, and the lesson is altogether of a higher order than the mere parrot-like repetition of letters.

What rules can be given should be taught thoroughly. For example:—

Formation of plurals of nouns ending in *y* or *e*; the doubling of a final consonant to keep the accented vowel short—for example, *sit, sitting*, etc.

These points are fully discussed in the text-book.

In *writing*, which is a more or less mechanical art, the chief points are—position of the body, method of holding the pen, and exact rules for the size, slope, and junctions of the letters. The analysis of the letters into elements is often asked for. Good writing will be found to consist in the proper formation of four or five simple strokes.

4. *Drawing.*—A freehand copy per week from the flat or from nature—for example, a plant, a flower, a group of leaves on a twig.

(See notes given last month on size, etc.)

5. *Music.*—Chap. v., *School Music Teacher.* Systematic ear training. This is a very important part of music teaching. Although it is not often questioned upon in the examination, still I should earnestly advise all young teachers to work carefully through the chapter, which will not only give them many valuable ideas for class use, but will also improve their own practical music, which is too often very much neglected.

6. *Needlework.*—The cutting out of a chemise by proportion and measurement.

7. *Penmanship.*—Ten minutes' daily practice on *The Practical Teacher Copy Book* (specially written for this examination).

8. *Spelling.*—One hundred words per week, from *Words Commonly Misspelt.*

9. *Composition.*—Write one or two essays each week on such subjects as the following:—"British Birds," "Public Libraries," "United Italy," "Common Sense," "The Pleasures of Mischief," "Perseverance," "The Character of Louis the Eleventh of France" (see *Quentin Durward*), "May a Person do what he likes with his own?" "The most useful Metal," "All is not Gold that glitters."

Many of these subjects must be read up and carefully thought out. I am often asked to recommend books for study in this subject; in fact, a week rarely passes without some appeal from a student. The answer: No book alone will teach you how to write a good essay. It is the result of careful reading and thought, and there is no short cut to success. There are many books of model essays published which supply ideas and suggest arrangement—for example, Meiklejohn's *Hundred Essays in Outline*—but the clothing of the skeleton must be your own. One unconsciously acquires manners and turns of expression from reading good books. Lamb's *Essays of Elia*, Macaulay's *Essays*, Emerson's *Essays*, Hazlitt's *Essays*, and some of the essays from the *Spectator*, are all standard works which may be bought for little, and repay careful study. But ideas on general topics are picked up in many ways. It is impossible to read a standard work properly without leaving it the richer in ideas. Above all, constant practice is necessary. Students are invited to send up essays for criticism. To leave the subject to chance is fatal to any success.

10. *English.*—

(1.) Twenty-five roots and meanings per week.

(2.) The grammar of the verb (*continued*).

(3.) Tudor literature.

(4.) *Julius Cæsar.*—Act III., Scene 1.

Notes on the Verb (continued).

Auxiliary Verbs.—An auxiliary (Latin, *auxilium* = help) is a verb used with the principal verb, to express some mood, tense, or voice which the principal verb cannot indicate by inflection. The Anglo-Saxon language was rich in inflections; the strife with the Norman-French resulted in destroying most of them. The Norman who was learning English got hold of the *stem*, but did not trouble himself about the *ending*, and soon the native followed his example. The classical languages are rich in inflection. Take, for example, a Latin verb. There are thirty-six different endings in the indicative mood active, and as many in the passive; twenty-four in the subjunctive active, etc. Or a French verb, like *porter*, to carry, has some fifty or sixty different forms. An English verb rarely possesses more than four or five. Hence, to indicate the various moods, tenses, etc., other words—auxiliaries, or helping verbs—have to be employed. If we want to express an action in the future, we must use *shall* or *will*; to form a perfect tense we must use *have* or one of its parts. Great care must be taken to distinguish an auxiliary verb from a principal defective verb. The test is in the definition above. Does it form some mood, tense, or voice? If not, it is not an auxiliary. The word *can* is often called an auxiliary in such a sentence as "I can go." This is wrong, utterly. It does not form any tense or mood, although its name is often justified by coining a "potential mood"—that is, a mood expressing "power." But if such a mood is allowed, why not have one to express "hope" (sperative) or "doubt" (dubitative), etc.? The term is inadmissible. *Can* is the principal verb, and should be analysed and parsed as such. Compare with the Latin *possum ire*, or the French *je puis aller*: neither *possum* nor *pouvoir* is an auxiliary. Some confusion often arises over *will*, which may be a simple auxiliary of the future tense or a principal verb. "If thou wilt, thou canst make me clean. I *will*; be thou clean." In this case *will* is a principal verb.

Again, *may* and *might* are sometimes auxiliaries of the subjunctive mood, and sometimes principal verbs. If they express doubt or hypothesis, they are auxiliaries; if they express permission or power, they are not. In such a case as "You may (= have permission to) go," *may* is the principal verb.

All the auxiliaries are followed by the verb in the infinitive mood, except *to have* and *to be* (with all their parts), which are always followed by a participle.

Do is an auxiliary of emphasis only when special stress is laid upon it. In other cases it is used to make another form of the present or past tense—for example, "If he does not go" = if he goes not.

Defective Verbs.—A defective verb is one which cannot be conjugated in all its moods and tenses. Some of the auxiliaries are defective.

Ought is the past tense of the verb *to owe*, and is used as such by Shakespeare. "He said you *ought* him a thousand pounds."

Wit is usually used as the infinitive. "I do you to wit" = I make you to know. (A.S., *witan* = to know.) It is occasionally found in the past tense. "He *wot* not what would become of him."

Hight is the perfect of *hatan* = to call or be named.

Need means "to be under the necessity of doing something." It must not be confused with the adverb *needs*. For example, "He must needs pass through Samaria." Here *needs* = of necessity, and is an adverb. Compare *Julius Cæsar*: "The plague that needs must light on this ingratitude."

Dight is the perfect participle of the Anglo-Saxon *dihtan* = to adorn. Com-

pare Milton: "And storied windows richly dight, casting a dim, religious light."

Worth is a part of the old verb *weorthan* = to become. For example, "Woe worth the day" = woe be to the day.

Thinks, in "methinks," means *seems*, from the Anglo-Saxon *thincan* = to appear. It must not be confused with *thinks*, from *thencan*, to think. It is an impersonal verb, the subject being *it* understood, or a noun sentence which follows. *Me* is a dative governed by it.

Me-lists = it pleases me. So also Scott: "When him listed his magic wand to wave." This is equivalent to, "when to wave his magic wand listed him."

Quoth is the old past tense of *cwethan* = to say. For example, "Quoth the Raven, 'Nevermore.'"

Wont is the perfect participle of *wunian* = to be accustomed to.

Yclept is the perfect participle of *cleopian*, to call. The *y* = *ge*, the inflection of the perfect participle, which exists in *handy-work* = *hand-gewore*, done by hand (*not* handy-work). Spenser has *yclad*.

Notes on Difficulties in "Julius Cæsar."

(Students must write for assistance in any difficulty.)

(1.) *It is not for your health*, etc. *It* is impersonal, and stands for the infinitive phrase following "thus to commit," etc.

(2.) *Nor for yours neither. Neither* is redundant in this case; used to emphasise the statement.

(3.) *Sign for me to leave you. To leave* is an infinitive limiting the noun sign.

(4.) *Render me worthy. Worthy* is an adjective used proleptically after *render*.

(5.) *Vouchsafe.* A verb in the imperative mood.

(6.) *To wear a kerchief.* An infinitive phrase limiting *time*.

(7.) *What's to do. To do* is the active form of the infinitive, with a passive meaning, qualifying *what*, and equivalent to, "what is to be done." Compare "bread to eat"—that is, to be eaten; "house to let" = to be let.

(8.) *Cæsar shall forth*, etc. The character of Julius Cæsar suffers somewhat at Shakespeare's hands. He is represented as vain, boastful, bragging of his constancy of purpose, yet continually changing. He alters his mind three or four times in this scene, is easily duped by Decius Brutus, and easily persuaded by his wife. This is a very different man from the real character in history.

(9.) *There are no comets seen.* This refers to the popular superstition that the appearance of a comet betokened the birth of a great man, an idea which probably had its origin in the appearance of the star to the wise men. As "great men" are continually being born, some one's birth was sure to occur when a comet was visible, and hence a mere coincidence was regarded as cause and effect.

(10.) *Your wisdom is consumed in confidence.* The wisdom which you usually exhibit is altogether overpowered by excessive confidence; *or*, You are too confident, and hence neglect to take the precautions which wisdom suggests.

(11.) *It were a mock*, etc. Analyse: Subject, *it*. Enlargement, *for some one to say*, etc. Predicate, *were a mock*. Extension, *apt to be rendered. To be rendered* = infinitive, modifying *apt*.

(12.) *To be thus waited for.* Infinitive phrase, limiting *I*.

(13.) *Prithee* = I pray thee. Analyse and parse as such.

(14.) *If it will please Cæsar*, etc. *It*, impersonal, in apposition with *to be so good*, etc.

11. *Geography.*—

(1.) Revise in detail Holland, Belgium, Denmark, and Scandinavia.

(2.) New Zealand.

Notebooks and maps must be freely used in revision. Pay special attention to the productions, imports, exports, and towns. The following questions have been asked on these countries:—

(1.) State what you know about the Dutch people and their language. Name the chief cities of Holland.

(2.) Contrast the life and surroundings of a Dutch peasant with those of a Laplander.

(3.) Give a short description of (*a*) the dependencies of the kingdom of Holland; (*b*) any people of Dutch descent not now politically dependent upon Holland. Mention places named by Dutch navigators which are not now politically connected with Holland.

(4.) Give the boundaries, approximate size and population, chief rivers, towns, and industries of Belgium.

(5.) Describe briefly the Scandinavian peninsula

(6.) Where and what are Hardanger Fiord, Sulitelma, Lofoden Is., Maelström, Glommen, Upsala, Geffe.

(7.) Say what you can of the industries, imports, and exports of Denmark.

(8.) Describe a tour through Belgium, visiting six large towns.

(9.) Belgium is sometimes called the "Battlefield of Europe." Why?

(10.) Explain "Land of the Midnight Sun," polders, Holland is the spice merchant of Europe, fjord, Laplanders.

New Zealand.—Chief Points. Area—North Island, 44,468 square miles; Middle Island, 58,525 square miles; Stewart Island, 665 square miles.

Population in 1901—Europeans, 772,719; natives (Maoris), 43,101.

Note the "wonderland" of the North Island with its volcanoes, hot springs, mud springs, etc. The beautiful pink and white terraces were destroyed by a volcanic eruption.

Climate, equable. Mean summer temperature, 63°; winter, 48°. Admirably adapted for raising every fruit, flower, and edible that flourishes in Great Britain.

Productions. The kauri pine, valued highly for shipbuilding, a particularly hard, firm-grained wood, which has to some extent been recklessly wasted. Kauri gum, native flax (*phormium*) used in manufacture of rope and twine. The islands are well timbered. Gold, iron, coal, and copper are mined. Sheep-rearing is the chief industry, there being 20,000,000 sheep.

Exports. Total value, £13,000,000. Gold, silver, fish, kauri gum, timber, butter and cheese, frozen meat, rabbit skins, wool and tallow, potatoes, skins and hides.

Imports. Total value, £10,000,000. Iron and steel goods, cotton goods, apparel, woollen goods, machinery, spirits.

The Government consists of (1) a Governor, Earl of Ranfurly. (2.) A Legislative Council of forty-four, appointed by the Governor for seven years. (3.) A House of Representatives of seventy-four (four of whom are Maoris), elected for three years.

Chief Towns. Wellington (50,000), Auckland (68,000), Dunedin (53,000), Christchurch (58,000), Sydenham (11,000), Invercargill (10,000), Napier (9,000), Nelson (7,000), Oamaru (5,000).

History, 1825. First attempt at colonisation—a failure.
1840. Settlement at Port Nicholson.
1840. Islands annexed to the Crown by the Treaty of Waitangi.
1841. Made a separate colony—settlement at Taranaki.
1848. Settlement at Otago by a colonisation company.
1849. Settlement at Canterbury by a colonisation company.
1856. Responsible government granted, mainly through the efforts of Sir George Grey.
1860–70. A series of disastrous Maori wars.
1861. Discovery of gold.

The Maoris. The natives of New Zealand, called Maoris, are a very interesting people, and differ very much from the degraded aborigines of Australia. They lived originally in the south-east of Asia, and were driven thence by the Aryan immigration to the islands of the Pacific, Fiji, Samoa, etc. Their journeys were made, according to their traditions, which are probably true, in large, double canoes. There were probably two migrations from Samoa to New Zealand, which they reached about 1350 A.D. They resemble the natives of Samoa in their build, speech, and love of athletic games. They are a good-looking, well-set-up race, and capable of much development mentally. The fact that they crossed hundreds of miles of sea in open canoes built by themselves at once stamps them with some superiority. On their settlement in the island they divided into tribes, and the tribal system still obtains in the reservations. They brought with them the yam, or sweet potato, which they cultivated; and this, with edible roots, birds, sharks, dogs, etc., formed their food. The scarcity of animal food led them to become cannibals. They manufactured the native flax into garments, and with their stone axes felled trees, built houses, and enriched them with carving by no means destitute of artistic ability. Their villages, or *pahs*, were built on a naturally strong position, and further fortified by stockades, and during the Maori wars proved difficult posts for a European force to take. They pride themselves on their bravery and truthfulness.

Since they have come into contact with civilisation, many of them have attended schools with excellent results. Four of them are in the House of Representatives, and several have taken degrees at the universities. The Englishman generally looks down on a native, but in the case of the Maori he cannot but respect him as a man.

12. *History.*—Henry IV. to 1485.

Points requiring especial attention.

(1.) The position of Henry IV. as an *elected* king. Results:—

(*a*) Parliament had supported him. Hence he had to grant them privileges—
Freedom of speech permitted.
Management of king's household attacked. Reforms granted.
All money grants to originate in the Commons.
The growing power of the Commons was entirely checked in 1430 by a Disfranchising Act, which took the right to vote from nearly all the Commons, and made Parliament no longer a representative body.

(*b*) The Church had supported him. Hence he had to grant the statute "De Heretico Comburendo" directed against the Lollards.

(*c*) The Barons had supported him. Hence the revolts—
1400. By Earls of Huntingdon and Kent and Salisbury.
1401. By Glendower of Wales and the Percies.
1407. By Northumberland and Scrope (latter executed).
1408. By Earl of Northumberland. Defeated and slain at Bramham Moor.

(2.) Henry V. Campaign in France.

(3.) Decline of the English power in France in the time of Henry the Sixth. This was due to some extent to the enthusiasm raised by Joan of Arc, but there is another factor which is of more importance. The Duchy of Burgundy, which consisted of a large part of North-East France, and what is now Belgium, was a fief of the French Crown, but the Duke of Burgundy was as rich, and nearly as powerful, as the French monarch. In 1419 John, Duke of Burgundy, was murdered at Montereau by the servants, and in the presence, of the Dauphin. To avenge this, his successor, Philip the Good, made an alliance with England, and the two countries united were more than a match for France. The Duke of Bedford, who acted as regent in France, married the sister of the Duke of Burgundy; and, notwithstanding the invasion of Hainault (a possession of Burgundy) by the Duke of Gloucester, the alliance stood firm till the death of the Duchess in 1432. Bedford then married Jacquetta of Luxembourg without obtaining the permission of her feudal lord, the Duke of Burgundy, and this weakened the alliance; and on the death of Bedford in 1435, the Duke of Burgundy gave up the English, and made his peace with France. The transference of the support of this powerful state to our enemies made an enormous difference to the English cause.

(4.) The Wars of the Roses. Causes, character, and results. Prepare a full genealogical table showing the rival houses.

13. *Arithmetic.*—Commission, brokerage, insurance, profit and loss.

The whole of Exercise 96 (Christian and Collar) should be worked through. In all profit and loss sums the cost price must be taken as 100. Remember also that the sums paid to gain different percentages are not in proportion to the percentages gained. This is a very frequent source of error. For example, a student reasons thus: If an article is sold at 10s. at a gain of 10 per cent., it must be sold at 20s. to gain 20 per cent. This is altogether wrong. The ratio between the selling prices is not 10 : 20, but 110 : 120.

Another common type of question is, "A sold a horse to B, gaining 7½ per cent. B sold it to C, gaining 10 per cent., and received £70, 10s. What did A pay for the horse?"

It is wrong to say total gain per cent. = 7½ + 10 = 17½. Let cost price = 100. Then A sells to B for 100 + 7½ = 107·5. Now B sells to C for 107·5 + 10 per cent. of 107·5 = 107·5 + 10·75 = £118·25. Then state—

Cost price of 118·25 = 100.

" " $1 = \frac{100}{118{\cdot}25}$.

" " $70{\cdot}95 = \frac{100 + 70{\cdot}95}{118{\cdot}25}$, etc.

Another common type is, "By selling tea at 1s. 6½d. per lb., a man loses 7½ per cent.; at what price must he sell to gain 12½ per cent.?"

Take 100 as cost price. Then selling price in the first case = 100 − 7½ = 92½; in the second case, 100 + 12½ = 112½. The ratio of the prices is 92½ : 112½, and the money will be in the same ratio.

14. *Algebra.*—Harder problems. Chapter xxiv., Hall and Knight.

15. *Euclid.*—Revise definitions, axioms, and postulates, and Props. 1 to 8, Book I., with six deductions per week.

16. *Languages.*—Next two paragraphs *Life of Epaminondas.* As much reading in French as possible. (As I find it impossible to set work to suit all students, those requiring assistance on any special points must write for it.)

17. *Elementary Science.*—Elementary chemistry. Mixture and compounds. Water. Composition by analysis and synthesis. Oxygen, nitrogen, hydrogen, carbon, iron, and mercury.

18. *General Information.*—Answers to questions asked.

(1.) Several students failed to find an answer to the question as in the Competition Questions—namely, "How is it that England is in a flourishing condition, although the value of the imports exceeds that of the exports by £150,000,000."

If the wealth of England depended entirely upon imports and exports, we should soon be in a sad condition; but there are two great sources of income which more than make up the deficiency or the *apparent* deficiency—(1) the interest on the enormous amount of British capital invested in the colonies and foreign countries; and (2) the very large amounts earned by British ships when carrying goods for other countries.

(2.) Another question which puzzled many was, "Why is Europe the leading continent in the world?"

It is not an answer to say, "Because it is inhabited by the most enterprising races." *That* is a result, not a cause. The causes are several:—

(*a*) The enormous length of coast-line compared with area, and the great seas which penetrate deep into the continent, render sea communication easy.

(*b*) The great number of navigable rivers, and the absence of any barrier mountain chains, facilitate internal communication.

(*c*) The great natural wealth in forests and mineral deposits.

(*d*) But the chief factor is the climate, which is temperate. In the Arctic Regions the cold is so intense that a man's faculties are blunted; he has to spend all his life in obtaining food, and has no time for mental development except on the lines of a beast of prey. In the Tropics, on the other hand, the extreme heat is enervating, the people listless and idle. Why should they work when a bountiful nature provides them lavishly with food without any effort on their part? They want less to eat and less to wear than people in colder climes. In the Temperate Regions the climate is temperate, and nature provides little without the co-operation of man. If he will work, she will help; if he will not, he must starve. Consequently the man becomes hard-working, ingenious, self-confident, and proud of his work. He has not to give *all* his time to labour, but enough time is left for him to devote his energies to the acquisition of knowledge; and knowledge is power. Hence it is that in the temperate zones, both north and south, we find the finest specimens of mankind.

(3.) "What is the origin of St. George and the Dragon?"

That St. George, the patron saint of England, was a real person, and not a mythical character, has been sufficiently shown, but little of his life and actions has been discovered. Gibbon, in his *Decline and Fall of the Roman Empire*, asserts that he was George of Cappadocia, an Arian bishop of Alexandria, torn to pieces by the populace in 360; but this has been disproved. There seems no reason to deny that he was born in Armorica, and beheaded in 303, during the Diocletian persecution. St. Jerome (331-420) mentions him as a martyr. Venerable Bede (672-735) states that he was beheaded. On the establishment of the Order of the Star and Garter by Edward the Third, he was adopted as the patron saint.

The dragon trodden under foot was no doubt emblematical of sin, and signified the triumph of the Cross over paganism, in the same way that Christian in *The Pilgrim's Progress* overcomes Apollyon; but as a legend often grows out of a device, so a more romantic tale has arisen about St. George and the Dragon. This is given in a ballad in Percy's *Reliques*. St. George was (according to this) born at Coventry, and on attaining manhood fought against the Saracens. He went to Sylene, a town in Libya, where there was a monster to whom every day a virgin had to be sacrificed. At length it came to the lot of Sabra, the king's daughter, to be the victim. She was tied to a stake, waiting to be devoured, when St. George came up and killed the dragon by thrusting his lance into its throat. He afterwards married Sabra and returned to Coventry. This tale is palpably a resetting of the mythological tale of Perseus and Andromeda.

(4.) "What is meant by, 'He was touched for king's evil'?"

King's evil was scrofula, a skin disease, and the idea prevailed from the time of Edward the Confessor to Queen Anne that it could be cured by royal touch. Dr. Johnson was the last person in England to be touched (1712). He was then two and a half years old, and the "touching" was performed by Queen Anne. Macaulay says that Charles the Second touched 92,107 persons. The idea arose from the belief that the monarch, as the vicegerent of God, could cure diseases. It was not limited to England, but was also credited on the Continent.

(5.) *Puzzled* asks where the mistake is made in the following:—

$$x^2 - x^2 = x^2 - x^2.$$
$$\therefore x(x - x) = (x - x)(x + x). \quad \text{Dividing by } (x - x).$$
$$\therefore x = x + x.$$
$$1x = 2x.$$
$$1 = 2.$$

This is an old algebraical puzzle. The mistake arises in dividing by $(x - x)$, which is really 0. When you cancel $(x - x)$ from each side, you are dividing by 0 and putting down a wrong quotient. Thus 0 divided into 5 is not 5, but infinity.

(6.) "Why do volcanoes, after lying dormant for a long time, burst out again into activity?"

A volcanic eruption is most probably caused by water finding its way through some crack or fault in the rocks to some place where the rocks are in a molten condition. The sudden generation of steam accounts for all the phenomena observed. If this is the cause, it is quite easy to understand that the fault through which the water passes may become closed and remain so for a long time, till some movement—possibly shrinkage of the earth's crust—again opens it.

Questions for Competition.

The answers to these questions are marked gratis. They should be sent *direct* to Mr. A. T. FLUX, The Bays, Belvedere, Kent, with a stamped addressed envelope for return. A prize of One Guinea is offered to the student scoring the highest percentage of marks during the year.

1. Give the derivation of the names of the months of the year.

2. Where do the following peoples live:—Pathans, Veddahs, Malagasy, Dyaks, Samoyedes, Basques?

3. By whom, and on what occasions, were the following spoken?—

(1.) "They have done for me at last, Hardy!"
(2.) "Let the whole line advance."
(3.) "I would rather be the author of that poem than take Quebec."
(4.) "Et tu, Brute!"
(5.) "Had I but served my God with half the zeal I served the king, He would not have given me over in my old age."
(6.) "Take away that bauble."

4. In what books do the following characters occur:—Amyas Leigh, Mrs. Poyser, Daniel Quilp, Sam Weller, The Red-cross Knight, Diana Vernon, Friday, Dogberry, Nydia, Allan Quatermain, Angela Messenger?

5. Where are the Llanos, Selvas, Tundras, Doldrums, Roaring Forties, Steppes, Bad Lands?

6. What is capillary attraction? Give instances.

7. Explain the following very briefly:—

(1.) The man in the moon.
(2.) Sun spots.
(3.) Darwinian theory.
(4.) The zodiac.

8. Write down the names of the ten most eminent men (in your opinion) now living.

Questions on the Work for the Month.

(The answers to these are marked and returned for a nominal fee of one shilling.)

1. Write as specimens of copy-setting:—
Large Hand—*Michael Angelo.*
Small Hand—*Python, the mighty giant slain*
By his good brand, relieved Bretagne.

2. What are the principal mistakes made in reading by young scholars, and how would you correct them?

3. Write an essay on "Cecil Rhodes and his Work."

4. Write notes on the word "running," as used in the following sentences:—

(1.) He was running.
(2.) When running he fell.
(3.) He is running a horse.
(4.) Running is quicker than walking.
(5.) By running he arrived in time.

5. Analyse the following, and parse words in italics:—

"Cowards die many times before their deaths;
The *valiant* never taste of death *but once.*
Of all the wonders that I yet have heard,
It seems to me most strange that men should fear,
Seeing that death, a necessary *end,*
Will come when it will come."

6. Write a character of Julius Cæsar as shown in the play, and quote passages to illustrate your statements.

7. Explain clearly what is meant by the Commonwealth of Australia.

8. Say what you can of the industries and towns of the Balkan Peninsula.

9. To what causes do you attribute the loss of the English possessions in France?

10. In what directions was the condition of the working classes improved in the fourteenth and fifteenth centuries?

11. (1.) Define gain and loss per cent., and show that to double the selling price converts a loss of 25 per cent. into a gain of 50 per cent.

(2.) A man buys a cwt. of tea. He sells one-half at 1s. 6d. per lb., and one-seventh at 2s. per lb.; one-sixteenth is wasted, and the remainder fetches £1, 8s. If on the whole a gain of 20 per cent. is made, find the original cost of the tea. Ans. £6.

(3.) A sells to B at a profit of 50 per cent. B then sells to C, and it is found to cost C 80 per cent. more than A. What percentage of gain did B make?
Ans. 20 per cent.

12. Explain refraction, index of refraction, total refraction.

PUPIL TEACHERS' COURSE FOR 1903.

Owing to the delay in the issue of the New Code, it is impossible to state clearly our future arrangements; these must consequently stand over till next month. But as it is inadvisable to allow a break in the routine of study, all pupil teachers would in any case do well for the present to continue work under Schedule V. of the 1901 Code. Whatever is done will not be lost.

Work for the Month.

1. *Teaching.*—Copy-setting on a blackboard should be practised from a good model. Definite rules as to the shape and size of all the capital and small letters should be learned. These are given in *The Practical Teacher Copy-Book*, specially prepared for students for these examinations.

2. *English.—Candidates.*—Learn the English, Latin, and Greek affixes, noting in each case not only the meaning but the use of the suffix—that is, whether it forms a noun from an adjective, as *brightness* from *bright*; an adjective from a noun, as *manly* from *man*, etc.

First Year.—Learn all the prefixes.

Second Year.—Common errors in language, written or spoken. These points are all given concisely in *The Pupil Teacher's English Notebook* (Messrs. T. Nelson and Sons).

3. *History.—Candidates.*—Read up carefully the history of England till the Romans left it. The Britons: who they were; dress, manners, religion, etc. Cæsar's invasions. The Roman Conquest. Roman walls and roads. Effects of the Roman occupation on the land and the people.

First Year.—Alfred the Great to Edward the Confessor.

Second Year.—Reign of James the First.

4. *Geography.—Candidates.*—Shape and size of the earth. Day and night. The seasons. Latitude and longitude. The oceans, tides, and currents.

First Year.—The physical features of Europe.

Second Year.—The physical features of Africa.

5. *Arithmetic.—Candidates.*—The simple rules. Proof by casting out nines. Multiplication and division by means of factors. The true remainder when dividing by the several factors of a number. Prime and composite numbers. Test of divisibility—that is, How can you tell at sight that a number will divide by 2, 3, 4, 5, etc.? G.C.M.

First Year.—Simple interest. *All* simple interest sums must be worked by fractional statements or by method of unity, and not by formulæ. The latter produce correct results, but they are rarely understood, and this way of working is mechanical, and not satisfactory.

Second Year.—Compound proportion (both proportion and method of unity).

6. *Euclid.—First Year.*—The definitions, axioms and postulates.

Second Year.—Props. 27 to 30, with four deductions per week.

7. *Algebra.—First Year.*—The meaning and use of brackets.

Second Year.—Factors. The following, and their application, must be clearly understood:—

$$(a+b)^2 = a^2 + 2ab + b^2.$$
$$(a-b)^2 = a^2 - 2ab + b^2.$$
$$(a+b)(a-b) = a^2 - b^2.$$
$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3.$$
$$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3.$$
$$(a^2+ab+b^2)(a^2-ab+b^2) = a^4 + a^2b^2 + b^4.$$

The rules for factoring a simple trinomial should also be learned. These points are all treated at length, and very clearly, in Hall and Knight.

8. *Science.—Candidates.*—Matter and its form. General and specific properties.

First Year.—Heat and temperature. Effects. Thermometers.

Second Year.—Mixtures and compounds. Water and its composition.

CORRESPONDENCE: RULES.

To ensure an answer in the next issue, queries must be sent by the 15th of each month.

Name and address of sender, with coupon of current number of THE PRACTICAL TEACHER (and *nom de plume* if desired), must be enclosed.

As a rule, all replies will appear in the Correspondence Column; but any one desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to "Mr. A. T. FLUX, The Bays, Belvedere, Kent."

ANSWERS TO CORRESPONDENTS.

Fearless Frank.—Your freehand would score about 2 out of 20 marks. A drawing should be absolutely *clean*. Yours is not. The shape is very poor, and is not much like the copy. You must give closer attention to the subject, especially the "lining-in." (See remarks in the Course in previous months.)

Livy.—The following is an answer to your query:—The water in the bowl acts as a prism, and splits up the white light into the component colours of the spectrum. Some of these colours lie under the shadow, and are visible. On the side nearest the source of light the violet end of the spectrum would be seen, on the farther side the red end of the spectrum. This is readily seen if you draw a diagram and trace the course of the dispersed rays.

H. Y.—I should strongly advise you to get the book recommended in the Course. It is far in advance of the one you have, and it possesses the advantage of being drawn up particularly to suit scholastic examinations.

X. Y. Z. wishes to know the reason for the method adopted in extracting the cube root of a number. The rule is based upon the algebraic rule, and if you do not understand algebra, I am afraid no explanation will make the arithmetical rule clear. You will not be asked to prove it.

(*Other correspondents answered by post.*)

NOTES ON "QUENTIN DURWARD."

(*Continued.*)

(*N.B.—The pages refer to the New Century edition of the novel published by Messrs. T. Nelson and Sons, 35 Paternoster Row, London, E.C. 2s.*)

CHAPTER XXV.

Page 362. *Hainault.* One of the old provinces into which what is now called Belgium was divided. It occupied the central part.

Fructifying. Rendering fruitful. The wealth of the soil of the Netherlands arises from the fact that it is alluvium brought down by the Rhine and its tributaries.

364. *Fouriers and harbingers.* Forerunners; messengers sent on ahead to make provision for the reception and entertainment of the force, corresponding to our modern quarter-master. *Harbinger* was in Middle English *herbergeour*, possibly derived from the Teutonic *here* = army, *beorg* = protection.

Debout! debout!—Ha! Messires, en route, en route! Get up! Get up! Come, gentlemen, it is time to be moving on!

Desperate. Hopeless; not used in its modern limited meaning.

Breach. When a fortified place is attacked, an attempt is made to break down the wall in one place, and this "breach" is then stormed. It is the centre of the most desperate fighting.

365. *Pretty fellow.* A young man of some ability, not referring, of course, to exterior appearance.

Idiomatical. Using arrangements of words and phrases which would sound peculiar to a Frenchman.

Peronne. Called La Pucelle or the Maiden, because it had never been taken by man. (See note next page.)

366. *Hawking.* One of the commonest forms of hunting in the middle ages. The falcon was carried on the wrist, which was protected by a leathern gauntlet. When a heron or some other quarry was startled, the hood placed on the falcon to keep it quiet was removed and the bird loosed. It immediately endeavoured to fly directly over the quarry, so as to drop down or "swoop" on it. Very frequently the bird attacked threw up its strong talons and transfixed its enemy.

Barter. To exchange goods for goods.

Physiognomists. Persons skilled in reading the character and temperament of a man from the appearance of his face. The features certainly do, to some extent, reflect the thoughts of the mind.

367. *Statuary.* Sculptor. The term is now limited to the objects carved.

Seigneur takes his toll. In the middle ages, the lord of the manor levied dues on all goods bought and sold in markets on his domains. One of the chief demands of the villeins in Tyler's Rebellion was the abolition of these excessive market dues.

Venerable. To be venerated or revered. The word is now often limited to what is respected on account of its great age.

368. *Playing the Black Prince.* A reference, of course, to the campaigns conducted in France by the Black Prince, which proved so disastrous to that country.

369. *Foibles.* Peculiarities; weaknesses in a character. O.F. *foible* = feeble.

370. *Rouse.* A drinking bout; a carousal.

371. *Catchpolls.* A subordinate officer who arrests persons for debt. From the Low Latin *chassepultus*, one who chases chickens.

Refugees. Those who had fled from France to escape persecution.

Page 371. *Le Glorieux.* The boastful. This man, like many other famous fools, was an example of the proverb, "It takes a wise man to make a fool." He was not only sagacious and witty, but personally brave. He had on one occasion saved his master's life, and fearing to incur the enmity of his superiors, turned the affair into a joke by making such extravagant assertions of himself that he acquired the title of Boastful. (See page 400.)

372. *Bauble.* A stick surmounted by a head with asses' ears, the emblem of the court jester.

Linstock. A staff to hold a lighted match for firing cannon, before the invention of percussion caps.

CHAPTER XXVI.

373. *Etiquette.* Forms of ceremony or decorum.

Francis I. The husband of Maria Theresa, daughter of the Emperor Charles VI. On the death of the latter, he contested the empire with Charles VII., and was elected in 1745.

Charles VII. (1697–1745) was crowned emperor in 1742, and from then till his death was engaged in fighting with Francis I. and Maria Theresa.

374. *Cortege.* Train of attendants; procession.

Simulation and *dissimulation.* To simulate is to pretend to be what one is not, to dissimulate is to hide what one really is; the former is the assumption of some characteristic, the latter the disguising of what exists.

Diffidence. Fear.

Umbrage. Offence.

375. *When an exile.* Louis had been an undutiful son, and had headed several revolts against his father. This was the cause of his exile.

376. *Diabolical.* Devilish. Gr. *diabolos.*

Consanguinity. Blood relationship—origin of *cousin.*

Guerdon. Reward.

377. *Ora pro nobis.* Pray for us!

Par amours. For his love affairs.

378. *Personal deformity.* See page 113, the description of the princess.

Caustic. Lit. burning; fig. bitter, severe.

380. *Sumpter mules.* Mules used not for riding, but for carrying goods.

Exchanged the alliance of England, etc. John the Fearless, father of Philip the Good, and grandfather of the Duke of Burgundy, was murdered by the servants of the French Dauphin in 1419. The result was that Burgundy sided with England in the wars of Henry VI. The Duke of Bedford married the sister of Philip the Good, and the alliance was unbroken till the death of the duchess. When Bedford, in 1432, married Jacquetta of Luxembourg without the consent of the Duke of Burgundy, the latter severed his connection with England, and united his forces with those of France. From this time the English power in France declined. Hence the present remark.

Moderator. Arbitrator; judge; umpire.

381. *Hôtel de Ville.* Town Hall.

Couchée. The evening reception before the king retired to rest. The *levée,* the morning reception when he arose.

383. *St. Andrew's Cross.* The white cross on a blue ground—part of the Union Jack.

384. *The annalist of the time.* The writer of annals or history. Scott obtained most of his material for this book from De Comines' *Memoires.*

Seneschal. The steward or major-domo.

389. *Tête-dieu.* By God's head.

390. *Murcian bull.* Murcia is a province in the south-east of Spain, famous for its breed of bulls.

Dogmatist. One who lays down opinions with authority.

392. *Vota diis exaudita malignis.* Vows listened to by unfriendly gods.

393. *Sardonic.* Forced; heartless; unnatural.

394. *Tauridor.* Toreador; a bull-fighter.

CHAPTER XXVII.

396. *Cajole.* To cheat by flattery; to persuade another by false pretensions.

399. *Brantome* (1527–1614). A well-known French chronicler whose works—historical, anecdotical, and biographical—were published in fifteen volumes in 1740.

Repartees. Sharp, witty replies.

400. *Gasconading.* The inhabitants of Gascony, in France, were noted for their idle bragging—for example, one of them being asked what he thought of the Louvre in Paris, said it reminded him of his father's stables.

403. *Presently.* Immediately; *not,* as we use it, *after a little while.*

404. *Harebrained.* Mad as a March hare; giddy; foolhardy.

408. *Braw-warld dyes.* Fine showy ornaments and dress.

409. *Mêlée.* A general fight.

410. *Portcullis.* A heavy gate which descended vertically in grooves, and could be dropped instantly and effectually, where a gate swinging on hinges could not be closed.

Black Walloons. Walloons were the descendants of the original inhabitants of the Netherlands. A special regiment of them had been raised, which wore black armour.

412. *Panderly.* A pander is one who procures for another the means of gratifying his passion. From Pandarus, a character in Shakespeare's *Troilus and Cressida.*

Charlatan. A quack; a pretender.

Synod. A meeting or assembly.

CHAPTER XXVIII.

The Florentine. Dante, who wrote the great epic *Divina Comedia,* describing visits to heaven (Paradiso), hell (Inferno), and purgatory (Purgatorio). Over the entrance of hell is the inscription, "Abandon hope all ye who enter here."

413. *Donjon.* The central tower or keep, usually the strongest part of a castle.

Maistery moves the meadow. The greater number wins.

Charles the Simple. Charles III. of France (879–929). A man of no ability, who, after a useless struggle against the Normans, was deposed and imprisoned in Peronne till his death.

415. *Cicerone.* A guide; one who makes speeches. From *Cicero,* the Roman orator.

Page 415. *Garrulous.* Talkative.

416. *See the blood.* The popular superstition was that bloodstains would never wash out.

417. *Motley.* Parti-coloured dress which fools usually wore. *Purple* was under the Romans the imperial colour.

418. *Wot.* Know. From A.S. *witan,* to know.

420. *Driveller.* To drivel or dribble is to allow the saliva to run out of the mouth. A sign of early childhood, extreme age, or imbecility.

Infatuated. An infatuated person is one who acts foolishly. Lat. *fatuus* = foolish.

Quack-salving. Using salve or ointment, as a quack doctor does. Hence applied to any one who professes more than he can perform.

Word-mongering. To monger means to sell or barter. (Compare *ironmonger.*) A word-monger would be one who uses words in other senses than the right one, who deceives by his words.

Gull. Deceive.

Thrice-sodden. Boiled three times, and therefore very soft.

421. *Lady of Clery,* etc. The various "ladies" and "madonnas" known by local names were all representations of the Virgin, but the ignorant and superstitious often considered them as different persons, as Louis does in his prayer.

Omnipotent with Omnipotence. All-powerful with God. Prayers were directed to the saints, under the impression that they could influence God.

Gabelle. Salt tax.

The county of Boulogne, etc. He had made the Madonna of Embrun Count of Boulogne, as he had made the Virgin "Captain General" of the Scottish Archers.

422. *Work with thy child.* Persuade thy son, Jesus Christ.

Necromancer. A dealer in the black art.

423. *Trained me.* Drawn me. Lat. *traho,* I draw.

Lurdane. Blockhead. O.F. *lourdein,* from *lourd,* heavy.

424. *Legion of saints.* A legion of Christian soldiers massacred in the third century by order of the emperor.

425. *Finis coronat opus.* The rope finishes the work. The usual quotation is, *Finis coronat opus,* the end finishes the work.

427. *Grooms.* Servants; men. A.S. *guma* = a man.

429. *Kaisars.* Cæsars.

Ethnics. Heathens.

Legerdemain. Tricky. Lit. light of hand. Fr. *leger de main.*

430. *Our Lady of the Isle of Paris.* The original city of Paris occupied only the island in the Seine, on which the cathedral of Notre Dame (Our Lady) now stands.

St. Francis's cord. The monks of the Order of St. Francis always wore a cord knotted round their waist, to fasten the coarse mantle.

In extremis. On the point of death. It was another of those ignorant superstitions prevalent at that time, that if a man put on religious garb when he was about to die, he stood a better chance of heaven.

Budget. A bag.

Handsel. Earnest money; money paid for the first work done. The meaning is, "Will not these men make a start in learning our trade?"

GENERAL INFORMATION FOR SCHOLARSHIP.

We shall deal this month with that portion of our notebooks which is devoted to politics. This subject is, of course, far too wide-reaching to be treated exhaustively in the space of one short article; so we shall content ourselves with merely indicating the best methods by which students can enlarge their stock of general information on this most interesting subject.

In the first place, students should ascertain the name of their own representative, and the political party to which he belongs, and, at the same time, they should get an idea of what the political parties are, and also of the method of conducting a parliamentary election, in order to be in a position to explain such terms as Liberal, Conservative, Unionist, Irish party, general election, by-election, returning officer, vote by ballot, etc. Whitaker's *Almanac* will yield much valuable information. The student will there find a complete list of the Government offices, together with the names of the persons who hold those offices at the present time.

Perhaps the best method of obtaining information under this head is to read the parliamentary intelligence in the daily papers, and to note carefully all the terms and expressions found there; the meaning of these should then be ascertained from a book of reference, such as Mill's *Representative Government,* or Fonblanque's *How We are Governed,* and the information thus obtained entered in the notebook under convenient headings.

Thus, for example, in a daily paper we may read, "The Bill was then brought in, and read a first time without division." This at once leads us to inquire what is meant by a "Bill," and what is the *modus operandi* of passing a Bill.

We will proceed to deal with those points. *Bills* are divided into two classes—*Public* and *Private.* A *Public Bill* is one that affects the welfare of the State generally. A *Private Bill* is one that affects only a small portion of the community, and generally

empowers a company to carry out some enterprise which, although of public utility, the promoters hope will prove a source of profit to themselves.

In order to become law, a Bill must be passed by both Houses of Parliament, and receive the assent of the Sovereign. It may originate in either House, except in the following instances:—1. An *Act of General Pardon* must be initiated by the Sovereign. 2. All Bills dealing with estate, peerage, or naturalisation must originate in the House of Lords. 3. This is the most important exception—namely, that all Bills involving the levying of taxes, either directly or indirectly, or the appropriation or removal of any tax, must commence in the Commons.

The following are the steps through which a *Bill* must pass before it becomes an *Act of Parliament*:—

The member in charge of the Bill must, if in the House of Commons, first obtain leave to introduce his Bill; in the Upper House, however, a peer merely gives notice of his intention to introduce a Bill. If permission is given, the Bill is brought in and read a first time, and ordered to be printed; copies are then circulated among the members, in order that they may acquaint themselves with it before the second reading. When a Bill is read a second time, its principle is discussed, matters of detail being reserved for consideration in committee, which is the next stage in the history of the Bill. Bills of lesser importance are referred to the *Standing Committees* of the House, but for important measures the whole House goes into *committee*, when the Speaker quits the chair, and another parliamentary officer, the *Chairman of Committees*, presides. In committee the details of the Bill are discussed, and altered where necessary; the amended Bill is then reprinted, and read a third time. The Speaker then holds the Bill in his hands, and puts the question whether the Bill shall pass. When it has been passed by one House, it is sent to the other, where it passes through the same forms, after which it receives the royal assent, and is then a Statute or Act of Parliament.

The following terms have been gathered from, or suggested by, the papers during the last week, and serve to show how much information can be obtained in this way:—

The Privy Council is the chief council of the State. "From an early period," says Macaulay, "the kings of England have been assisted by a Privy Council, to which the law assigned many important functions and duties. But by degrees its character changed. It became too large for dispatch and secrecy, and the Sovereign, on the most important occasions, resorted for advice to a small knot of leading ministers."

The Cabinet.—This small group of ministers on whom the task of advising the Sovereign has devolved is called the Cabinet. Although the Sovereign has the right to select his own ministers, our system of party government necessitates the selection of those only who can command the support of the majority of the House of Commons; thus the selection of the Government is practically in the hands of the people.

The Treasury.—The responsibility of finding sufficient money to meet the national expenditure rests with the Treasury Board, which consists of the First Lord of the Treasury, three Junior Lords, and the Chancellor of the Exchequer.

The Budget.—This is the annual statement of the Chancellor of the Exchequer, which he submits to the House, showing the estimated expenditure of the various Government departments for the coming year, and the methods by which he proposes to obtain sufficient money to meet this expenditure. The Budget goes through the same stages as any other Bill; but, of course, the committee stage, in which the details are discussed, is by far the most important. The *Committee of Ways and Means* discusses the proposals for raising money, while the suggested ways of spending it are dealt with in *Supply*.

The money thus raised by Parliament at the suggestion of the Chancellor of the Exchequer constitutes the *Taxes*. *Rates* are levied by the local authorities for purely local purposes, and must not be confused with taxes.

Taxes are either *Direct* or *Indirect*. *Indirect Taxes*, such as those on tea, sugar, tobacco, are paid by the wholesale dealer, who, of course, recoups himself by increasing the price to the retailer, who in turn charges the consumer, who thus pays his tax indirectly.

The chief direct tax is the *Income Tax*. There are also taxes on land, houses, and such luxuries as carriages, male servants, and dogs. The chief source of the Treasury's revenue is the *Excise*, which accounts for about a quarter of the income of the nation, another fifth being contributed by the *Customs*. Broadly speaking, the excise is levied on articles of consumption manufactured in the country, such as beer, spirits, etc.; and customs on imported articles, such as tobacco, wine, etc.

OUR CERTIFICATE COURSE FOR 1902.

BY GEORGE COLLAR, B.A., B.SC.,
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TEST QUESTIONS ON LAST MONTH'S WORK.

Theory of Teaching.

1. Show that arithmetic should be taught not only on account of its utilitarian value, but also on account of its educative results.

2. How would you give a young child a correct idea of the number "two"?

3. What is meant by "habit"? Why is it desirable to form habits?

English Literature.

1. Give an account of the gathering summoned by Satan.

2. Explain the following:—Small infantry warred on by cranes; since first created man; orient colours; pilasters, architrave, cornice, frieze.

Geometry.

1. Prove that in a right-angled triangle the angle contained by the perpendicular let fall from the right angle on to the hypotenuse and the line joining the right angle to the middle point of the hypotenuse is equal to the difference between the two acute angles of the triangle.

2. If MN is produced to R so that the square on NR is equal to twice the rectangle MN, MR, then the sum of the squares on MN and MR is equal to twice the square on NR.

3. Show that the straight lines drawn through the angular points of a square parallel to the diagonals form the sides of a square.

Political Economy.

1. Distinguish between direct and indirect taxation. What are their respective advantages?

2. What special advantages does the income tax offer as a means of raising the revenue?

French.

1. Give, with illustrative examples, the rules for the agreement of the past participles of pronominal verbs.

2. Translate into French:—

"Let us do everything," said Mr. Rhodes, "that lies in our power to show the members of the other race that we have no feeling against them. Some of you who are on farms in the country will meet at divisional councils men who sympathised with the Transvaal: take especial care to be considerate and thoughtful of their feelings. When you are riding along among farms, make a point of stopping and having a chat."

3. Give the English equivalents of the following phrases:—à fond; tout à la fois; à l'avenir; trop tôt; plutôt; plus tôt; tour à tour; au plus tard; faute de poudre; au lieu de son chapeau; de bonne heure; à la bonne heure; tout de suite; tout à l'heure; à toute heure.

NOTES AND SYLLABUS FOR MAY.

Composition.

Write essays on the following subjects:—

1. The Force of Habit.
2. Hobbies.
3. "Brevity is the soul of wit."
4. Proverbs.

Theory of Teaching.

1. Finish chap. xii. of Collar and Crook's *School Management*.

In studying this chapter, close attention must be paid not only to the methods of teaching individual rules, but also to the sequence in the instruction in the subject as a whole. Many head-teachers seem to think that the only reason for co-ordinating the teaching in arithmetic is that one teacher may not have to undo the teaching of another, or lose time by making the children adopt different methods. But the positive reason is at least as strong as this negative reason, and it leads us, in teaching any rule, to give a preference to that method which will be most helpful in teaching the subsequent rules, unless it is in itself much more difficult than any other. This is particularly noticeable in the case of complementary addition, and in the multiplication and division of whole numbers considered as lead-

ing up to multiplication and division of decimals. Again, if the children are properly taught how to bring one quantity to the fraction of another, and also to find an assigned fraction of a given quantity, they can be taught proportion as merely a combination of the two.

Mental arithmetic demands a great deal of attention; for practical utility there is no form of exercise so important as the calculation of the cost of quantities, such as would be bought at a butcher's or a draper's. The accurate and rapid calculation of prices should be regarded as one of the most important *objects* in mental arithmetic. It may also be regarded as a *means to an end* in illustrating the principles underlying any rule. Simple mental examples form a valuable means of teaching a new rule or of revising an old one.

2. Study Dexter and Garlick, chap. xxiii. The writers have treated the important subject of character with such fullness and clearness in this chapter that there is nothing to add, and very little that will not be quite plain to the careful reader; but should any points present difficulty, we shall be glad to answer any questions that may be sent up.

3. Finish Locke's *Thoughts on Education*.

The student should carefully study the papers that Mr. Adams is now writing in THE PRACTICAL TEACHER.

ARITHMETIC.

We will work out one or two problems that have been set in previous Certificate Examinations.

1. A man bought 18 houses for £11196. He repaired them, and let each house for £27, 12s. 6d. per annum, thereby getting a return of 4¼ per cent. per annum on his money. What did he spend on repairs?

Total rent received = £27½ × 18 = £$\frac{221 \times 9}{4}$.

As this is 4¼ per cent., or $\frac{17}{400}$ of his outlay, his outlay = $\frac{400}{17}$ of £$\frac{221 \times 9}{4}$ = £11700.

∴ amount spent on repairs = £11700 − £11196.

Ans. £504.

2. Goods, value £388, 12s. 3d., are insured for a year at 3¾ per cent. on such a sum that the owner, in case of loss, may receive both the value of the goods and the amount of the insurance paid. For what sum must they be insured?

If the person insured received £100 in case of loss, according to the conditions given this would be equal to £3¾, the premium paid, and £(100 − 3¾), the value of the goods—that is to say, £(100 − 3¾) or £96¼ of goods must be insured for £100, and consequently £388½ must be insured, for

£$\frac{388\frac{1}{2}}{96\frac{1}{4}}$ of £100 = $\frac{31089}{7740}$ of £100 = £401, 6s. 8d.

3. A circular running-path is 553 yards round. Two men start back to back to run round, one running at the rate of 9½ miles and the other at the rate of 10¼ miles per hour. When and where will they meet for the first time?

Evidently the distance round the path must be divided in the ratio of their rates—that is, 9½ : 10¼, or 38 : 41. One man runs $\frac{38}{38+41}$ of 553 yds., but $\frac{2}{19}$ of 553 yds. = 266 yds. The other runs (553 − 266) yds. = 287 yds.

The time will be that required to run 266 yds. at 9½ miles per hour, or 287 yds. at 10¼ miles per hour.

$\frac{266}{1760}$ of $\frac{2}{19}$ hours = $\frac{7}{440}$ hours = $\frac{21}{22}$ minutes.

ENGLISH LITERATURE.

Revise the second book of *Paradise Lost*.

2. *Ormus*, or Ormuz, an island and town on the Strait of Ormuz; formerly the centre of Persian trade. *Ind*, of course, is poetic for India.

14. *I give not* = I do not give up.

17. *Trust.....second fate.* They had nothing to lose, but possibly something to gain, by a change, as they had fallen so low they could fall no further.

40. *By what best way*, etc. We now debate which is the best way.

52. *Unexpert* = lacking experience in. *Un-* is an English prefix; *expert* is from Lat. *expertus*. It is very unusual to find such hybrids in Milton. On the other hand, where a similar hybrid is in common use, Milton often goes back to the pure form.

69. *Tartarean*, belonging to Tartarus, the part of the infernal regions in which the wicked underwent their punishments.

73. *The sleepy drench of that forgetful lake*—that is, the sleep-producing immersion in the lake that produces forgetfulness. Moloch implies that the lake of fire into which the rebel angels had been cast may have caused them to forget everything, as the river Lethe was said to do by the ancients. (See lines 583–6.)

81. *The ascent is easy.* This is an inversion of the well-known Latin quotation, "Facilis est descensus Averni."

91. *Inexorably*, without any possibility of remission by means of prayer. (Lat. *orare*, to pray.)

94. *Incense*, to burn or kindle. The whole passage is a metaphor, in which Divine anger is compared to a fire which will consume and reduce to nothing those who kindle it.

97. *Happier far.....being.* We should be far happier if our being (essential) were reduced to nothing, than being miserable to exist for ever.

113. *Manna.* A symbol not only of sweetness, but of mystery. It is a Hebrew word meaning "What is it?" (See Exod. xvi. 15.)

142. *Our final hope is flat despair.* An example of the paradox. (See "Paradox" in the Figures of Speech.)

172. *Or from above.....us?* Or what vengeance which has been still for a time should again arm his red right hand to plague us from above?

177. *Impendent* = impending; hanging over; threatening us.

224. *For happy.....worst.* Though only ill when compared with happy lots, yet not the worst when compared with the miserable ones. Note the Latin construction—*for* in the sense of "when compared with," an imitation of the similar use of *pro*.

241. *To celebrate.* Originally this meant "to go in crowds," hence "to honour."

244. *Sovran*, from the Low Lat. *superanus*, one above. The modern form *sovereign* is due to a confusion with the verb "reign."

278. *The sensible of pain* = the sensibility to pain.

306. *Atlantean*, like those of Atlas, who was fabled to carry the world on his shoulders.

387. *Infernal states*, the deliberative assembly of the lower regions. (Compare States-General.)

396. *We may chance re-enter.* We may take *chance* either as an adverb (= perchance), or as a verb, in which case "re-enter" = to re-enter.

406. *Palpable obscure* = darkness that might be felt.

407. *Uncouth* = unknown: from the past participle of the A.S. verb *cunnan*, to know. Hence it was originally passive, although it has now rather an active sense—not knowing (how to behave).

412. *Senteries*—literally, guards who walk along a path: from Lat. *sentis*, Fr. *sentier*, a path.

417. *This said.* An example of the nominative absolute.

418. *Suspense.* Here an adjective = suspended. The Latin participle is *suspensus*, and Milton is very fond of forming adjectives directly from Latin participles.

432–3. Contrast with line 81 of this book.

439. *Unessential*, having no essence or being.

478. *Prone* = with the face towards the ground. The opposite is *supine*, which means "lying on the back."

490. *Louring.* Also spelt "lowering," but it must not be confused with the word meaning "letting down." It means "frowning," and is related to "leer."

491. *Landskip* = landscape: from the Dutch. The suffix *-skip* or *-scape* is the equivalent to *-ship* in "friendship."

517. *Alchymy* here means *brass*—that is, brazen trumpets.

539. *Typhœan* = like that of Typhon, a raging monster with a hundred heads, who made war upon the gods, but was subdued by the thunderbolts of Jupiter.

542. *Alcides*, another name for Hercules, who died in great agony through putting on a poisoned robe given him by his wife Dejanira.

558. *Elevate* = elevated. (See note on line 418.)

595. *Frore*, an obsolete word, from *froren*, past participle of *fréosan*, to freeze.

600. *Starve* denotes "to die." It did not connote, as it does now, that death comes from lack of food, although even now the expression "starved with the cold" is by no means uncommon.

614. *Tantalus*, a son of Jupiter, who was punished by being placed up to his neck in water, which always receded when he attempted to drink, while the ripe grapes growing over his head retreated when he attempted to pluck them. Hence the English verb "to tantalise."

620. *A fiery Alp*, a hot hill. Alp means really any high mountain, and is a Celtic word.

655. *Cerberean.* Cerberus was the three-headed dog that guarded the entrance to Hell.

661. *Trinacrian shore* = the coast of Sicily.

693. *Conjured*, leagued together by an oath. (Lat. *jus, juris*, an oath.)

709. *Ophiuchus*, the holder of the serpent; a constellation in the northern hemisphere.

719. *Hell grew darker at their frown.* Note the hyperbole.

736. *These*—that is, these words.

755. This account is borrowed from the classical account of the origin of Minerva, who sprang, fully armed, out of the head of Jupiter. Notice the idea: Sin springs from the head of Satan, and produces death; no one passes into Hell unless the door be opened by Sin.

827. *Errand.* This is the "contained object" of *go*. (Compare "to go a journey," to "run a race.")

912. *Sea, nor shore, nor air, nor fire*—that is, earth, air, fire, nor water, the four elements of which the alchemists believed every body in the universe to be composed.

922. *Bellona*, the goddess of war.

939. *Syrtis*, the quicksands on the north coast of Africa.

945. *Arimaspian.* The Arimaspi were said to be one-eyed people living to the north of Scythia, who by force and cunning sought to obtain the gold that was guarded by gryphons. The fable probably owes its origin to the fact that gold is found in the Ural Mountains.

996. *Confusion worse confounded.* An oft-quoted passage implying that that which was already confused becomes still more involved.

1016. *Wins his way.* The A.S. word *winnan* meant simply "to struggle," "to try to obtain," and the change in meaning that the word has undergone should teach a fine moral lesson of encouragement. If we struggle and try hard enough to obtain, we shall succeed—win, in the modern sense.

Geometry.

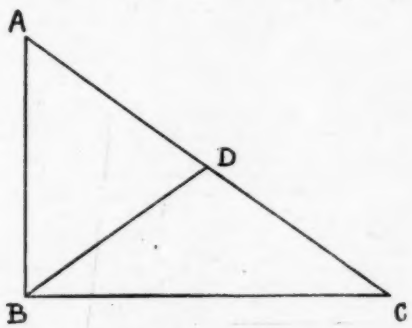
Revise the text thoroughly.

We will take one or two deductions that have been set in past years and show how to deal with them.

1. Every right-angled triangle is divided into two isosceles triangles by a straight line drawn from the right angle to the middle point of the hypotenuse.

In a question like this, many would make the mistake of taking the middle point in the hypotenuse and joining it to the right angle. This involves a clumsy and indirect proof. A better method is the following:—

Let ABC be any triangle right-angled at B. At point B in the line BC make the angle CBD equal to the angle BCD (I. 23). Then, because ABC is a right angle, it is equal to BCA and BAC



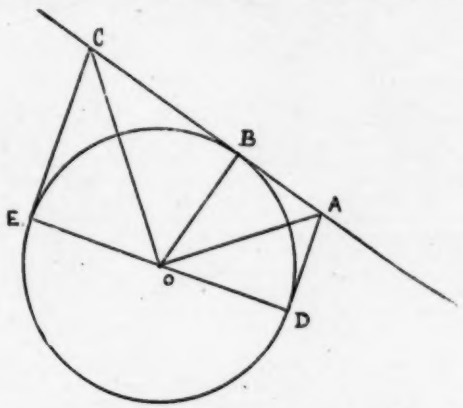
together. But since CBD = BCD (construction), ∴ ABD = BAD. Therefore AD = BD, and DC = BD (I. 6), and therefore AD = DC (ax. i.), and consequently BD is drawn to the *middle* point of the hypotenuse; and we have already shown that each of the triangles into which this straight line divides the triangle ABC is isosceles.

2. If any straight line be drawn touching a circle, the part of it intercepted between the tangents at the extremities of any diameter subtends at the centre a right angle.

Let the straight line ABC touch the circle DBE at point B, and let A and C be the points at which it is cut by the tangents drawn through the extremities of any diameter DE; then if O be the centre of the circle, AOC shall be a right angle.

In analysing this, as we know that DOB and BOE are together equal to two right angles (I. 13), we can prove AOC to be a right angle if we show that it is half the sum of these two angles, and a glance at the figure suggests that DOA = AOB, and BOC = COE.

In the triangles DOA and BOA, because OD = OB, and OA is common, and AD = AB since the square on each is equal to the rectangle FA · AG (III. 36), therefore the included angle BOA equals the included angle DOA (I. 8). Similarly, it may be



shown that BOC = EOC, and therefore COA = the sum of EOC and AOD, and is therefore a right angle (I. 13).

Trigonometry.

Revise from the beginning, and make sure of the *proofs* of any formulæ that have been forgotten. Such is the dependence of any part of trigonometry on the parts that have preceded it that it is not possible to go on without remembering the formulæ; but the student will find that he has forgotten how to establish the truth of some of the very formulæ with the use of which he is most familiar. The proofs should therefore be revised this month, and miscellaneous exercises worked.

French.

We will this month take up one or two questions from back papers and show how to answer them.

I. Correct where necessary, giving your reason for the correction in each case:—

(*a*) Croyez-vous qu'il peut sortir?
(*b*) Le deuxième Avril, c'est Vendredi.
(*c*) Une livre et demi.
(*d*) Voici des pommes; les mangez.
(*e*) Il est impossible de ne trouver pas le livre.
(*f*) Deux cents trois soldats.
(*g*) Berne et des autres villes.
(*h*) L'on s'a habitué.

(*a*) In this example the subordinate clause denotes a matter about which there is uncertainty, so the verb should be in the subjunctive—*qu'il* puisse *sortir*.

(*b*) As a whole, it is not quite clear what the sentence means. If it is meant to state that this is Friday the second of April, it should be—*C'est* (*aujourd'hui*) *vendredi le deux avril.* Notice that, with the exception of *premier* for the first, all the days of the month are denoted by the *cardinal* numerals; also that names of days of the week and months of the year do not require a capital.

(*c*) *Demi* is here an adjective, and should be *demie.* The English noun "half" is translated by *moitié;* the adjective by *demi*, which must agree with the noun it qualifies if the noun comes first; but if *demi* precedes the noun it is invariable, and must be joined to the noun by a hyphen, as *une demi-livre.*

(*d*) If the order is to eat all the apples, we should use the pronoun *les*, but write it after the verb, as the latter is in the imperative affirmative; but if the order is to eat some of the apples, the pronoun *en* should be used—*mangez-les* or *mangez-en.*

(*e*) With an infinitive both parts of the negative should come before the verb—*de ne pas trouver le livre.*

(*f*) *Cent* should not take an *s* although preceded by a number which multiplies it, because it is followed by another number —*deux cent trois soldats.*

(*g*) Before an adjective, the proper form for the partitive article is simply *de—Berne et d'autres villes;* or if the meaning is "a few other towns," "certain other towns," the phrase should be—*Berne et quelques autres villes.*

(*h*) *On* sometimes takes the article at the beginning of a sentence, but it is not necessary. Pronominal verbs require the auxiliary *être*, and to complete the phrase an indirect object is required, such as *y* = to it—*On s'y est habitué.*

2. Translate into French:—
(*a*) Are you the queen whom we seek? I am.
(*b*) Are you a queen? I am.
(*c*) He has broken his arm.
(*d*) Bring me the book; do not bring me the letter.
(*e*) It is they who have accused me.

(*a*) *Êtes-vous la reine que nous cherchons? Je la suis.*
(*b*) *Êtes-vous reine? Je le suis.* Observe that in every case the complement of the verb *être* must be expressed in French. If not given in English, we must use one of the pronouns—*le*, *la*, or *les*. Notice, further, that if this complement refers to some definite person, as in (*a*), it varies; but if it simply refers to a state or quality it is invariable, as in (*b*).

(*c*) *Il s'est cassé le bras.* Notice the use of the pronoun as indirect object, and the use of the definite article instead of the possessive adjective.

(*d*) *Apportez-moi le livre; ne m'apportez pas la lettre.* The pronoun comes after the verb in the first case, because the verb is in the imperative without a negative; but as there is a negative in the second clause, the ordinary rule for the place of pronouns is observed.

(*e*) *C'est eux qui m'ont accusé.* The form *eux* is used instead of the conjunctive form *ils*, as the complement of the verb *être*. If a lady wrote the remark, she should write *accusée*.

OUR CERTIFICATE COURSE FOR 1903.

Test Questions on Last Month's Work.

1. What purposes are served by notes of lessons? Write notes of a lesson on the reign of Richard the Third.
2. Into what classes were freemen divided in Saxon times? Give a summary of the political duties and privileges of each.
3. Explain the terms *thane*, *earl*, *boc-land*, *Witenagemôt*, *tithing*, *scot*, and *lot*.
4. Write a summary of the second Act of *Richard the Third*.
5. What is a "county borough"?
6. Name the six largest seaports of England, and say what imports and exports pass through them.

NOTES AND SYLLABUS FOR MAY.

Theory of Teaching.

Study chap. vii. in Collar and Crook's *School Management*. It is highly important to realise the two different principles on which the early lessons in reading may be based—namely, we may begin with the sounds and proceed to show the signs that represent them, or we may show the signs and then associate the appropriate sound with each. As children at the age of three or four, when they are beginning to learn to read, have already gained a certain amount of familiarity with the sounds, it is best to make use of the knowledge they have in imparting to them some fresh knowledge.

The different orders in which the letters should be taught should receive the careful consideration of the student. If we start with the first of the above principles, a phonetic grouping supplies the easiest and most natural order of taking the letters. If, on the other hand, we start with the signs, a phonetic arrangement is of less use, and logically we have to adopt an order which begins with the simplest *form* of letter and proceeds to the most complex. The question whether we shall begin with the capital or small letters is comparatively unimportant. The child has to learn both, and it matters very little which comes first. The claim of the small letters to priority of treatment rests upon their frequent use, while that of the large ones rests on their simplicity of form. Perhaps the best plan is to begin with the capitals and then derive the forms of the small letters from these.

The reading lesson is the special time for correcting faults in pronunciation; and the list of common faults given in the chapter should be carefully studied, as it is not enough to recognise that a child's pronunciation is incorrect, but the cause must be discovered, and the appropriate remedy applied. This generally requires more than an order to imitate the teacher, for the child is often unable to recognise where he is wrong, and we may be sure that if he did he would try to correct himself of his own accord.

The student must pay great attention to the matter of expression in reading, and many young teachers greatly err in their notions of what expression means. Intonation, or modulation of the voice, is one thing, expression is another. The former may be acquired by the mere imitation of the teacher's pattern reading; the latter can result only from the habit of grasping the full meaning of the sentence and then giving out that meaning as though making an original statement.

English Language and Literature.

Study carefully the third Act of *Richard the Third*. This is easy to analyse in point of its relation to the development of the action of the play, and the passages that illustrate character are very easily picked out. In fact, the speeches of the different *personæ* are suggestive almost to a fault.

Read the first half of *Kenilworth*.

English History.

Study in detail the Norman Conquest—the fourth and last conquest of England recorded in history. At first sight it might appear that the Normans and the Danes were of identical stock, and therefore added no new element to the English nation. But the Danes who settled in England had come direct from their Scandinavian homes, whereas a century and a half had elapsed between the settlement of "Rolf the Ganger" as Rollo, first Duke of Normandy, and the invasion of England by his descendant William the Conqueror.

The following points should be remembered in connection with the origin of the Normans:—Rolf, a Norwegian rover, plundered Norwegian coast towns as well as others, and was banished from Norway about the year 870. He joined Guthrum and the other Danes who were plundering England; but finding the opposition of Alfred more strenuous than that offered in the north of France, he made that the scene of his operations, and after subjecting the country to a long period of devastation, he took permanent possession of Rouen, and obliged the French king, Charles the Simple, to cede to him the duchy of Normandy. This was effected in 911 by the treaty of Saint Clair-sur-Epte, by which Rolf embraced Christianity and married a daughter of the French king. The Normans then divided out the land "by the rope," according to their custom, and dispossessed the original occupiers. Although the Norman court adopted the customs of the French one, the individual Normans retained much of their original freedom; adopting, however, the language and habits of their French neighbours, from among whom they obtained their wives. Those Normans who refused at first to accept Christianity settled in the neighbourhood of Bayeux, and retained their northern language and customs longer than those who were farther east; but by about 1020 we may consider that all the Normans had adopted French civilisation, and by the frequent intermarriages were largely of French origin.

The dangers which had threatened Western Europe from the invasions of the Huns had revived the "Holy Roman Empire," and the power of Otho the Great was such that he gained a great victory over the Magyars at Lechfeld in 955, which quite checked the tide of Hungarian conquest. In 960 he was appealed to by Pope John the Twelfth to put an end to the disturbances caused by local quarrels in Italy. He did so, and in return was anointed and proclaimed by the Pope, who also swore allegiance to him. During the reigns of Otho and of his two immediate successors the temporal power was unquestionably supreme; but after the death of Otho the Third, in 1002, the empire fell into feeble hands, while a man of great force—Hildebrand, who in 1073 became Pope Gregory the Seventh—set himself to invert the order of things, and not only keep all temporal rulers from interfering with the election and appointment of church dignitaries, but make them acknowledge the temporal supremacy of the Pope, and permit him to interfere in any quarrels between one state and another or in any internal political quarrel. This was the state of things when William proposed that the rival claims of Harold and himself should be submitted to the decision of the Pope. Harold, who had nothing to gain and everything to lose by such a course, naturally declined; but William formally sent delegates to lay the matter before the Pope. The papal decision was drawn up in a document or "bull," which was sent to William with a consecrated ring and banner.

Geography.

Study carefully the political geography of Scotland and Ireland, and endeavour, as far as possible, to connect the political facts with the physical features to which they are due.

THE HUMAN BODY.

A Physiology Reader for Schools.

By John Berry Haycraft, M.D.,
Professor of Physiology in the University of Wales.
170 pages, and over 40 Illustrations. Cloth extra, price 1s. 6d.

THOMAS NELSON AND SONS, 35 and 36 Paternoster Row, London Parkside, Edinburgh; and New York.

LONDON MATRICULATION.

June 1902.

"HELPS" FOR THE LATIN PAPERS.

BY C. J. PHILLIPS, M.A.,
Stockwell Pupil Teachers' Centre.

Answers to Questions on Cicero Set Last Month.

Chapter xxi.

1. (*a*) "For so long as we are shut up in these bodily frames, we are performing a function and a heavy labour (set us) by destiny, for the spirit is a heavenly (being), brought down from its house on high, and, as it were, plunged into earth, a sphere alien to its divine nature and its immortality."

(*b*) "And (I believe that) since the spirit is always being moved, and yet has no source of movement, seeing that it moves itself, (so) it will not have any end either of movement, seeing that it will never depart from itself; and (that) since the nature of the spirit is simple (that is, not compound), and has not in itself any admixture which is foreign to or unlike it, (so) it cannot be divided, and, if that cannot be, it cannot perish."

2. *Modo* is abl. sing., from *modus*. It is used here in its substantive sense—that is, "in moderation"—not adverbially, as often is the case.

Delibatos is acc. plur. masc., agreeing with *animos;* from *delibatus*, past partic. of *delibo, -are, -avi, -atum*.

Pythagoras taught, according to Aristotle, that souls were particles emanating from the sun.

Chapter xxii.

1. "And, indeed, the souls of those who are asleep reveal especially their divine nature; for when they are released and set free they foresee many things which are to be; and from this fact we can understand what they will be like when they shall have altogether freed themselves from the chains of the body. Wherefore, if these things are so, 'Regard me,' said he, 'as a god; but if the soul is going to perish together with the body, yet you, reverencing the gods, who oversee and direct all this beautiful world (lit., all this beauty), will preserve the memory of me with affection and sanctity.'"

2. Cato dicebat animum omnino esse interiturum nunquam sibi persuasum iri; *or*, Cato negabat unquam sibi persuaderi posse animum omnino interiturum esse.

Chapter xxiii.

1. (*a*) "Or do you imagine that I—to make a boast about myself, after the manner of the aged—would ever have undertaken such severe labours by day and night, at home and in the field, if I were destined to limit my fame within the same boundaries as my life?"

(*b*) "For my part, I am impelled by a longing to see your fathers, whom I knew and loved; and, indeed, I long to meet not merely those whom I have personally known, but also those of whom I have heard and read and myself written; and truly nothing would easily draw me back now setting out in that direction, or 'cook' me back like Pelias."

(*c*) "Now old age is the completion of life, as of a story, and we ought to flee from the weariness of it, especially when satiety is joined thereto."

2. *Cuiusque* is gen. sing. masc., from *quisque*. *Optimus quisque* = "each best man;" so "all the best men."

Quid is nom. sing. neut., from *quis*. It is used here in an emphatic sense like *quidquam*. Many editors read *quis* here.

Calce, abl. sing., from *calx*. *Calx* is lit. "a chalk line to mark the end of a course;" so "goal."

3. Credebat Cato non eos solum quos vivus coluisset, sed illos etiam de quibus legisset et scripsisset, se mortuum esse visurum.

Answers to Test Sentences Set Last Month.

1. Nonne tu credis nos, nisi civibus auxilio advenisset Antonius, urbem oppugnaturos fuisse?

2. Gaius dixit se nunquam intelligere posse utrum domus sua ornamento an dedecori urbi Fregellis esse videretur.

3. Nos autem, hostes Corinthum pervenisse certiores facti, statim homines quinquaginta misimus Galbam monituros ne in portum, dum rediissent equites Romani, iniret; *or*, qui Galbam monerent; *or*, Galbam monitum (*supine*).

4. Si tu patris tui similis esses, non dubitares ea facere quae iubeat mater tua; *or*, quae iuberet; *or, if the clause,* "*which your mother tells you,*" *is not a causal, but purely a parenthetical one,* quae iubet.

5. Noli admirari si audiveris Marcum filiam meam ut ei nubat oravisse.

In this number we propose to give a short model examination in the Latin work for matriculation, and hope to have space in the June number for a complete set of answers to the questions now set.

A

1. Decline together in full:—*Vetus poema, audax dea, grandius ras.*

2. Give the Latin for:—Ninety-seventh, three million and five hundred thousand, the twenty-third of July, leap-year.

3. Write a short sentence to illustrate the use of each of the following words, and translate your sentences into English:—*Nemo, nullus, quisquam, uter, quisquis.*

4. Give the principal parts of the verbs from which the following forms come:—*Oblitus, pependere, abstulistis, saluimus, experrecto, adultum, visit, desieris.*

B

Put into Latin:—

1. We should have reached Sicily on the 19th of May, if we had not heard of the death of Crassus just as we were going to start.

2. He said he did not understand why you had not advised him to return home with you until your brother set sail.

3. Where he went, how he went, why he went, I have no idea.

4. As we feared he would not arrive in time, we sent fifty horsemen to meet him.

5. Surely there is no doubt that you ought to have persuaded him to come with you to Philippi.

6. The city of Veii was not far from Rome.

7. The emperor gave to the citizens ten sesterces apiece.

8. Mancinus sent a messenger to ask the Spaniards for peace.

9. Do not speak as though we knew not of the things you are plotting.

10. We pity the innocent, but nothing shall prevent us from punishing the guilty.

11. When the murderer hears thunder, he fears that it is directed against his own life.

C

1. Translate:—

(*a*) At sunt morosi.....qui in Adelphis sunt (c. xx.).

(*b*) Quod eodem modo.....iucundissima est (c. iii.).

(*c*) Quid habet enim.....discedam (c. xxiii.).

2. Write a short note explaining the references in the following:—

(*a*) A quo Caudino proelio Sp. Postumius T. Veturius consules superati sunt.

(*b*) Eum librum qui Panathenaicus inscribitur.

(*c*) M. Curius cum de Pyrrho triumphavisset.

(*d*) Qui essent Italici philosophi quondam nominati.

D

Translate:—

(*a*) Id vero militibus fuit pergratum et iucundum, ut ex ipsa significatione cognosci potuit, ut, qui aliquid iusti incommodi exspectavissent, ultro praemium missionis ferrent. Nam cum de loco et tempore eius rei controversia inferretur, et voce et manibus universi ex vallo, ubi constiterant, significare coeperunt, ut statim dimitterentur, neque omni interposita fide firmum esse posse, si in aliud tempus differretur. Paucis cum esset in utramque partem verbis disputatum, res huc deducitur, ut ei, qui habeant domicilium aut possessionem in Hispania, statim, reliqui, ad Varum flumen dimittantur; ne quid eis noceatur, neu quis invitus sacramentum dicere cogatur, a Caesare cavetur.

(*b*) Sed inter eas moras repente sese Metellus cum exercitu ostendit; Numidae ab Iugurtha pro tempore parantur instruunturque; dein proelium incipitur. Qua in parte rex pugnae affuit, ibi aliquamdiu certatum est; ceteri eius omnes milites primo congressu pulsi fugatique. Romani signorum et armorum aliquanto numero, hostium paucorum potiti; nam ferme Numidas in omnibus proeliis magis pedes quam arma tutantur.

(*c*) Si quis nos deus ex hac hominum frequentia tolleret et in solitudine uspiam collocaret atque ibi suppeditans omnium rerum quas natura desiderat abundantiam et copiam, hominis omnino aspiciendi potestatem eriperet, quis tam esset ferreus qui eam vitam ferre posset cuique non auferret fructum voluptatum omnium solitudo?

OUR QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Calorie.—Would you kindly give solutions to the italicised portions of the following questions:—

(*a*) Describe some method of finding the specific heat of a gas at constant pressure.

With what other properties is the specific heat of a perfect gas directly connected?

(*b*) By what processes does hot water standing in an open vessel lose heat?

Describe experiments by which the existence of the several causes of loss can be determined.

(Board of Education, Heat, Advanced, 1901.)

(*a*) The specific heat of a perfect gas at constant pressure bears a definite relation to its specific heat at constant volume, depending on the number of atoms in a molecule. Thus, for a monatomic gas, the ratio γ of the specific heats at constant pressure and constant volume is equal to 5/3. As the number of atoms in a molecule increases, γ becomes more and more nearly equal to unity. The value of γ is connected with a number of physical properties of a gas. Thus the **adiabatic relation between the pressure** p **and the volume** v of a perfect gas is given by

$$pv^{\gamma} = \text{a constant.}$$

The **adiabatic elasticity** of a perfect gas is equal to γp.

The **velocity of sound** in a perfect gas is equal to

$$\sqrt{\frac{\gamma p}{\rho}},$$

where ρ is the density of the gas.

Proofs of these relations may be found in Edser's *Heat for Advanced Students*, pp. 300–303, 317–327.

(*b*) The vessel containing the hot water loses heat—

(1) **By Evaporation.**—For every gram of water which evaporates, an amount of heat equal to the latent heat of steam is lost. This cause of loss may be avoided by using a closed vessel to contain the hot water.

(2) **By Convection.**—The air near the vessel becomes heated, and rises up, its place being taken by cold air, which in its turn is heated, and rises up.

(3) **By Conduction.**—The air molecules near the vessel are set in motion with enhanced velocity, and communicate greater velocity to the molecules with which they collide.

(4) **By Radiation.**—In this case energy is carried away from the vessel by ether waves.

The rate at which heat is lost by convection is greater in comparison as the surrounding gas is denser. Therefore the rate of loss in this case varies with the pressure of the surrounding gas. On the other hand, the rate of loss by conduction is independent of the pressure, as long as this does not fall so low that the mean free path of the gas molecules is comparable with the dimensions of the vessel used to surround the cooling body. The rate of loss by radiation is quite independent of the pressure of the gas surrounding the cooling body. Thus, if we surround the cooling body with a closed vessel, and determine the rate of loss of heat for a number of different pressures of the contained gas, we can plot a curve showing the variation in the rate of loss with the pressure of the contained gas. On producing the curve so as to determine what would be the rate of loss at zero pressure, we can determine the rate of loss due to radiation and conduction, and the loss due to convection is found by subtraction. Finally, by pumping as much as possible of the air out of the containing vessel, so as to obtain an approximately perfect vacuum, we can determine the rate of loss due merely to radiation, and thus find the loss due to conduction by subtraction. Thus all causes of loss can be determined. (See Edser's *Heat*, pp. 432, 455.)

Geological.—Suitable text-books for the Honours B.Sc. Examination of the London University are the following:—

General Physics.—Minchin's *Statics*, Part I. (Clarendon Press); Minchin's *Elementary Hydrostatics and Kinetics* (Clarendon Press); *A Treatise on Physics*, Vol. I., by Andrew Gray, published by J. and A. Churchill, 7 Great Marlborough Street.

Sound.—*Text-Book of Sound*, by Poynting and Thompson; *Cours de Physique*, Vol. III., by Jamin and Bouty, published by Gauthier, Villars et Fils, 55 Quai des Grands Augustins. These may be supplemented by Lord Rayleigh's book on *Sound*.

Light.—Heath's *Geometrical Optics* (Cambridge Press); *Theory of Light*, by Thomas Preston, M.A. (Macmillan).

Heat.—*Theory of Heat*, by Thomas Preston, M.A. (Macmillan).

Magnetism and Electricity.—*Elements of Mathematical Electricity*, J. J. Thomson (Cambridge Press); Gray's *Absolute Measurements in Electricity*.

Practical Physics.—*Elementary Practical Physics*, 3 vols., Stewart and Gee (Macmillan).

B.Sc. (London) *Honours in Geology.*—*Text-Book of Geology*, by Archibald Geikie, F.R.S. (Macmillan); Kayser and Lake's *Comparative Geology* (Sonnenschein); Harker's *Petrology* (Cambridge Press); Marr's *Stratigraphical Geology* (Cambridge Press); Wood's *Palæontology* (Cambridge Science Series). Books for reference: Zittel's *Palæontology*, translated by Eastman (Macmillan); *International Geography*, by Mill (Newnes). For practical work, supplement Grenville Cole's *Practical Geology* (Griffin and Sons) by the above books.

In practical work, questions relating to maps are usually set. An incomplete contoured geological map is given, and the candidate has to fill in the geological outlines. These questions are dealt with in Green's *Physical Geology*.

Rather complicated maps are given, reversed faults, unconformities, etc., and the candidate has to make sections from them.

In both physics and geology the candidate is expected to be conversant with recent literature.

XVIII. *Principles of Mining* (Adv.).—*Text-Book of Ore and Stone Mining*, by C. Le Vere Foster (Griffin); *Text-Book of Coal Mining*, by Hughes (Griffin).

L.L.A., H.E.A.—Suitable books for Board of Education Examinations:—

I. *Practical Plane and Solid Geometry.*—See Query Column PRACTICAL TEACHER, March 1902.

V. p. *Practical Mathematics* (Advanced Stage).—*Elementary Practical Mathematics*, by F. Castle (Macmillan); and Perry's *Practical Mathematics* (Eyre and Spottiswoode).

VII. *Applied Mechanics* (Advanced Stage).—Jamieson's

Applied Mechanics (Macmillan); Perry's *Applied Mechanics* (Cassell and Co.).

XI. *Organic Chemistry* (Theoretical Advanced). — *Organic Chemistry*, by Perkin and Kipping.

XI. p. (Adv.).—There is no really suitable book, but Rideal's *Practical Organic Chemistry* (Lewis) and George's *Practical Organic Chemistry* (Univ. Corr. Coll,) may be used along with theoretical book.

Arum.—Trace the curve $x^4 + y^4 = a^2xy$, and find the points at which the tangent is parallel to an axis of the co-ordinates. Find the area of its loops. (B.Sc., London, 1897.)

The curve passes through the origin, and is obviously symmetrical in opposite quadrants, since there is no change in its equation on substituting $-x$ for x, and $-y$ for y. Transforming to polar co-ordinates, the equation reduces to

$$r^2 = \frac{a^2 \cos\theta \sin\theta}{\cos^4\theta + \sin^4\theta} \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

And this may be written in the form—

$$r^2 = \frac{a^2}{2} \cdot \frac{\sin 2\theta}{(\cos^2\theta + \sin^2\theta)^2 - \frac{1}{2}(\sin 2\theta)^2};$$

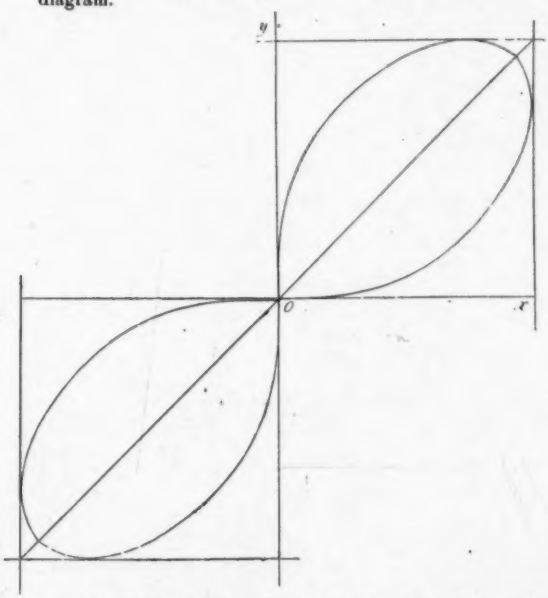
$$\text{or } r^2 = \frac{a^2}{2} \cdot \frac{\sin 2\theta}{1 - \frac{1}{2}\sin^2 2\theta} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

Hence r is greatest when $\sin 2\theta \div (1 - \frac{1}{2}\sin^2 2\theta)$ is greatest. Differentiating with respect to θ, the last expression becomes $\{2(1 - \frac{1}{2}\sin^2 2\theta)\cos 2\theta + 2\sin^2 2\theta \cos 2\theta\} \div \{1 - \frac{1}{2}\sin^2 2\theta\}^2$.

Hence for a maximum value of r, we must have either $\cos 2\theta = 0$, or $1 + \frac{1}{2}\sin^2 2\theta = 0$. The latter of these gives no real value of θ; therefore r is greatest when $\cos 2\theta = 0$—that is, when $\theta = \frac{\pi}{4}$, and $\frac{5\pi}{4}$.

Then, from (2), it follows that the greatest value of r is a.

The curve, therefore, consists of two loops, as shown in diagram.



Writing the given equation $\phi \equiv x^4 + y^4 - a^2xy = 0$ (3), we have $\frac{dy}{dx} = -\frac{\delta\phi/\delta x}{\delta\phi/\delta y} = -\frac{4x^3 - a^2y}{4y^3 - a^2x}$.

For points at which the tangent is parallel to the axis of x, we have $\frac{dy}{dx} = 0$.

Hence the equations $\begin{cases} x^4 + y^4 - a^2xy = 0 & . \quad (4) \\ 4x^3 - a^2y = 0 & . \quad (5) \end{cases}$

determine the points at which the tangent is parallel to the axis of x. Substituting in (4) the value of a^2y given by (5), we have—

$$y^4 - 3x^4 = 0.$$

$$\therefore \frac{y}{x} = \sqrt[4]{3}.$$

Hence $4x^3 = \sqrt[4]{3}a^2x$.

$$\therefore x = 0, y = 0; \text{ or } x = \pm\frac{3^{\frac{1}{4}}a}{2}, \quad y = \pm\frac{3^{\frac{3}{4}}a}{2}.$$

Similarly, for points at which the tangent is parallel to the axis of y, we have $\frac{dx}{dy} = 0$. These points are therefore determined by the equations—

$$\begin{cases} x^4 + y^4 - a^2xy = 0 & . \quad . \quad . \quad . \quad . \quad (6) \\ 4y^3 - a^2x = 0 & . \quad . \quad . \quad . \quad . \quad (7) \end{cases}$$

Solving these, we obtain—

$$x = \pm\frac{3^{\frac{3}{4}}a}{2}, \quad y = \pm\frac{3^{\frac{1}{4}}a}{2};$$

or $x = 0$, $y = 0$.

For the area of the loop in the first quadrant we have—

$$\tfrac{1}{2}\int_0^{\frac{\pi}{2}} r^2 d\theta = \frac{a^2}{2}\int_0^{\frac{\pi}{2}} \frac{\sin\theta\cos\theta}{\cos^4\theta + \sin^4\theta} \cdot d\theta.$$

Let $\tan\theta = u$; then the last expression becomes—

$$\frac{a^2}{2}\int_0^{\infty} \frac{u\,du}{1+u^4} = \frac{a^2}{4}\int_0^{\infty} \frac{2u\,du}{1+u^4}.$$

Taking $u^2 = v$, this becomes—

$$\frac{a^2}{4}\int_0^{\infty} \frac{dv}{1+v^2} = \frac{a^2}{4}\Big[\tan^{-1}v\Big]_0^{\infty}$$

$$= \frac{a^2}{4} \cdot \frac{\pi}{2} = \frac{\pi a^2}{8}.$$

Hence the area of the two loops is $\frac{\pi a^2}{4}$.

J. W. Grant.—A man's yearly income is £A: his daily expenses are B shillings and F pence; his quarterly payments for rent, etc., are £C. What did he save last year?

If A = 6C and C = 3B = 3F, what must be his income for him to save £22, 11s.? (Certificate Algebra.)

Assuming "last year" is not a leap year, the expression for his expenditure is—

$$£\Big[365\Big(\frac{B}{20} + \frac{F}{240}\Big) + 4C\Big] \quad . \quad . \quad . \quad . \quad (1)$$

The amount saved (that is, the difference between income and expenditure) is—

$$£\Big[A - \Big\{365\Big(\frac{B}{20} + \frac{F}{240}\Big) + 4C\Big\}\Big].$$

If we substitute in (1) the given values of B, F, and C in terms of A, we obtain for the expenditure the following expression:—

$$£\Big[365\Big\{\frac{\frac{A}{18}}{20} + \frac{\frac{A}{18}}{240}\Big\} + 4\frac{A}{6}\Big]$$

$$= £\Big\{365\Big(\frac{1}{18\times 20} + \frac{1}{18\times 240}\Big) + \frac{2}{3}\Big\}A$$

$$= £\Big\{73\Big(\frac{1}{72} + \frac{1}{18\times 48}\Big) + \frac{2}{3}\Big\}A.$$

And this is obviously greater than £A.

Hence the data of the question are inconsistent.

M.M.—Solve the equation—

$$\left.\begin{aligned} x - y + z &= n \\ \frac{x}{b+c-a} = \frac{y}{c+a-b} &= \frac{z}{a+b-c} \end{aligned}\right\}$$

(S.K. Mathematics, Stage 2, 1892.)

Let $\frac{x}{b+c-a} = \frac{y}{c+a-b} = \frac{z}{a+b-c} = k$, say.

$$\therefore x = k(b+c-a).$$
$$y = k(c+a-b).$$
$$z = k(a+b-c).$$
$$\therefore x - y + z = k(b+c-a-c-a+b+a+b-c)$$
$$= k(3b-c-a).$$
$$\therefore k = \frac{x-y+z}{3b-c-a} = \frac{n}{3b-c-a}.$$

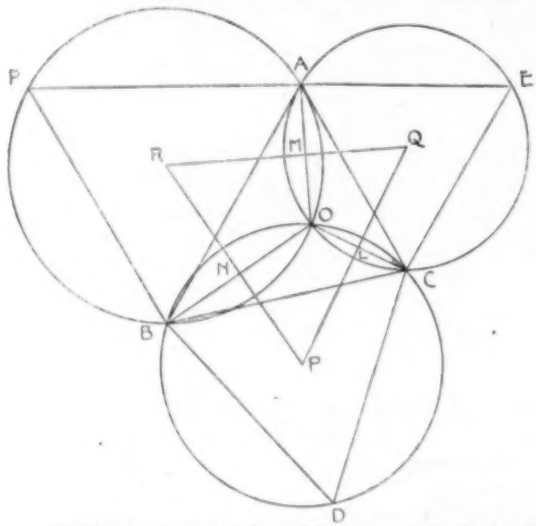
Hence $x = \frac{n}{3b-c-a}(b+c-a)$,

$$y = \frac{n}{3b - c - a}(c + a - b),$$

$$z = \frac{n}{3b - c - a}(a + b - c).$$

H.P.—Prove that if equilateral triangles are drawn on the exterior of the sides of any triangle, their centres will always form an equilateral triangle.

(London Matriculation, January 1902.)



Let ABC be any triangle, and let the equilateral triangles DBC, ECA, FBA be drawn on the exterior of the sides of ABC. Let P, Q, R be the centres of the equilateral triangles—that is, the centres of the circumscribing circles of the triangles. Join PQ, QR, RP. Then PQR shall be equilateral.

Let the circumscribing circles of the triangles AEC, AFB intersect in the points A and O. Join OA, OB, OC.

Then because the quadrilateral AOCE is inscribed in a circle, therefore the angles AOC, AEC are together equal to two right angles. But AEC is two-thirds of a right angle, therefore AOC is four-thirds of a right angle. Similarly, the angle AOB is four-thirds of a right angle. Therefore the remaining angle, BOC, is four-thirds of a right angle. Hence BOC, BDC are together equal to two right angles. Therefore the points B, O, C, D lie on the circumference of a circle—that is, the circle circumscribing the triangle BDC passes through O.

Let PQ, QR, RP cut the chords OC, OA, OB in L, M, N. Then by a previous part of question the angles at L, M, N are right angles. Hence a circle described on OR as diameter will pass through O, M, R, N. Therefore the angles MON, MRN are together equal to two right angles.

Hence the angles MON, MRN are together equal to the angles MON, BFA. Therefore the angle at R is equal to the angle at F.

Similarly, the angle at P is equal to the angle at D, and the angle at Q to the angle at E.

Hence the triangle PQR is equiangular, and is therefore equilateral. *Q.E.D.*

Sha.—Through any point P on an ellipsoid chords PQ, PR, PS are drawn parallel to the axes. Find the equation of the plane QRS, and show that the locus of K, the point of intersection of the plane QRS and the normal at P, is another ellipsoid. Show also that if the normal at P meet the principal planes in G_1, G_2, G_3, then will

$$\frac{2}{PK} = \frac{1}{PG_1} + \frac{1}{PG_2} + \frac{1}{PG_3}.$$

(Smith's *Solid Geometry*.)

Let the equation of the ellipsoid be

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1.$$

Let P be x^1, y^1, z^1.

Then Q is $-x^1, y^1, z^1$.
R is $x^1, -y^1, z^1$.
S is $x^1, y^1, -z^1$.

The plane through the three given points QRS is—

$$\begin{vmatrix} x, & y, & z, & 1 \\ -x^1, & y^1, & z^1, & 1 \\ x^1, & -y^1, & z^1, & 1 \\ x^1, & y^1, & -z^1, & 1 \end{vmatrix} = 0.$$

$$\therefore \begin{vmatrix} x, & y, & z, & 1 \\ 0, & 0, & 2z^1, & 2 \\ 2x^1, & 0, & 0, & 2 \\ 0, & 2y^1, & 0, & 2 \end{vmatrix} = 0.$$

Expanding according to the constituents of the first column, we have—

$$x2y^1(4z^1) + 2x^1\{y4z^1 + 2y^1(2z - 2z^1)\} = 0;$$

that is, $8(xy^1z^1 + x^1yz^1 + x^1y^1z - x^1y^1z^1) = 0.$

Dividing by $8x^1y^1z^1$, this reduces to

$$\frac{x}{x^1} + \frac{y}{y^1} + \frac{z}{z^1} = 1 \quad \ldots \ldots \ldots \ldots \quad (1),$$

which is the required equation of the plane QRS.

The equations of the normal at P are—

$$\frac{x - x^1}{\frac{x^1}{a^2}} = \frac{y - y^1}{\frac{y^1}{b^2}} = \frac{z - z^1}{\frac{z^1}{c^2}} = rp.$$

Where the normal meets the plane QRS—that is, at the point K—we have—

$$x = x^1\left(\frac{rp}{a^2} + 1\right),\ y = y^1\left(\frac{rp}{b^2} + 1\right),\ z = z^1\left(\frac{rp}{c^2} + 1\right) \ldots \quad (2)$$

Since $\frac{x^1{}^2}{a^2} + \frac{y^1{}^2}{b^2} + \frac{z^1{}^2}{c^2} = 1$, because P is a point on the given ellipsoid, it follows from (2) that

$$\frac{x^2}{a^2\left(\frac{rp}{a^2} + 1\right)^2} + \frac{y^2}{b^2\left(\frac{rp}{b^2} + 1\right)^2} + \frac{z^2}{c^2\left(\frac{rp}{c^2} + 1\right)^2} = 1,$$

which is the equation of an ellipsoid, and this is the locus of K.

Also substituting from (2) in (1), we have—

$$\frac{rp}{a^2} + \frac{rp}{b^2} + \frac{rp}{c^2} = -2.$$

$$\therefore rp = -\frac{2}{\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2}} \quad \ldots \ldots \ldots \quad (3),$$

where $r = -$ PK.

Where the normal meets the plane $x = 0$,

$$rp = -a^2,$$

$$r = -\frac{a^2}{p},$$

$$PG_1 = \frac{a^2}{p},$$

$$\frac{1}{PG_1} = \frac{p}{a^2}.$$

Similarly, $\frac{1}{PG_2} = \frac{p}{b^2}$ and $\frac{1}{PG_3} = \frac{p}{c^2}$.

From (3) $p\left(\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2}\right) = -\frac{2}{r} = \frac{2}{PK}.$

$$\therefore \frac{2}{PK} = \frac{p}{a^2} + \frac{p}{b^2} + \frac{p}{c^2} = \frac{1}{PG_1} + \frac{1}{PG_2} + \frac{1}{PG_3}.$$

Q.E.D.

L.L.A., H.E.A.—Your question is incomplete. You say, "Annie bought 16 yards [ ] than Mary." Kindly state whether the word you have omitted is "more" or "less."

Rex.—If in the equation $\sin(\omega - \theta) = \sin\omega\cos\alpha$, θ be small, show that its approximate value is

$$2\tan\omega\sin^2\frac{\alpha}{2}\left(1 - \tan^2\omega\sin^2\frac{\alpha}{2}\right).$$

(Indian Civil Service.)

First approximation. $\sin(\omega - \theta) = \sin\omega\cos\alpha.$

$\therefore \sin\omega\cos\theta - \cos\omega\sin\theta = \sin\omega\cos\alpha.$

Hence, neglecting θ^2 and higher powers,

$$\theta = \tan\omega(1 - \cos\alpha) = 2\tan\omega\sin^2\frac{\alpha}{2}.$$

Second approximation. Neglecting θ^3 and higher powers,

$$\sin\omega\left(1 - \frac{\theta^2}{2}\right) - \cos\omega.\,\theta = \sin\omega\cos\alpha.$$

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Substituting $\theta = 2\tan\omega\sin^2\frac{a}{2}$ in the small term containing θ^2, we get—

$$\sin\omega\left(1 - 2\tan^2\omega\sin^4\frac{a}{2}\right) - \cos\omega\,.\,\theta = \sin\omega\cos a.$$

$$\therefore \theta = \tan\omega\left\{1 - 2\tan^2\omega\sin^4\frac{a}{2} - \cos a\right\}$$

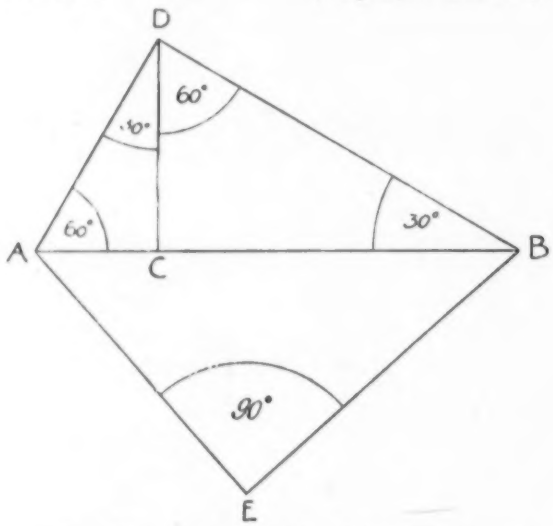
$$= \tan\omega\left\{(1 - \cos a) - 2\tan^2\omega\sin^4\frac{a}{2}\right\}$$

$$= \tan\omega\left(2\sin^2\frac{a}{2} - 2\tan^2\omega\sin^4\frac{a}{2}\right)$$

$$= 2\tan\omega\sin^2\frac{a}{2}\left(1 - \tan^2\omega\sin^2\frac{a}{2}\right)$$

Q.E.D.

Eurasian.—A man observes the elevation of the top of a tower to be 60°. He then walks a distance of 300 feet, takes a turn of a right angle, and after walking 400 feet more, finds he is on the other side of the tower, opposite to his original position. The elevation of the tower is now found to be 30°. Find the height of the tower. (Pierpoint's *Mensuration.*)



Let CD represent the height of the tower, A the first station, and B the second. Then by the question ACB is a straight line, $\angle DAC = 60°$, $\angle CBD = 30°$.

Let E be a point in the horizontal plane through foot of the tower 300 feet from A and 400 feet from B, and $\angle AEB = 90°$.

$\angle ADC = 90° - 60° = 30°$; $\angle CDB = 90° - 30° = 60°$.

$\therefore \angle ADB = 90°$.

$AB^2 = AE^2 + EB^2 = 300^2 + 400^2 = 500^2$.

$AD = DC \sec ADC = DC \sec 30° = \frac{2}{\sqrt{3}}DC$.

$BD = DC \sec BDC = DC \sec 60° = 2DC$.

$\therefore AD^2 + BD^2 = \left(\frac{4}{3} + 4\right)DC^2$.

But $AD^2 + BD^2 = AB^2$, since $\angle ADB = 90°$.

$\therefore \left(\frac{4}{3} + 4\right)DC^2 = AB^2 = 500^2$.

$\therefore 16DC^2 = 3 \times 500^2$.

$\therefore 4DC = 500\sqrt{3}$.

$\therefore DC = 125\sqrt{3}$

$= 125 \times 1{\cdot}732$

$= \underline{216{\cdot}5 \text{ feet.}}$

Flora.—Sum to n terms

$$1^2\cdot 2^2 + 2^2\cdot 3^2 + 3^2\cdot 4^2 + \ldots.$$

(Cambridge Senior, 1901.)

The general term of the given series is

$$n^2(n+1)^2 \equiv n^2(n^2 + 2n + 1) \equiv n^4 + 2n^3 + n^2.$$

Hence the sum to n terms of the given series is the sum of

$$1^2 + 2^2 + 3^2 + \ldots + n^2$$

+ twice the sum of $1^3 + 2^3 + 3^3 + \ldots + n^3$

+ the sum of $1^4 + 2^4 + 3^4 + \ldots + n^4$.

In any modern text-book on higher algebra, it is proved that the sum of $1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{1}{6}n(n+1)(2n+1)$,

" " " " $1^3 + 2^3 + 3^3 + \ldots + n^3 = \frac{1}{4}n^2(n+1)^2$,

" " " " $1^4 + 2^4 + 3^4 + \ldots + n^4 = \frac{n}{30}(n+1)(2n+1)(3n^2 + 3n - 1)$.

(See C. Smith's *Treatise on Algebra*, Art. 321.)

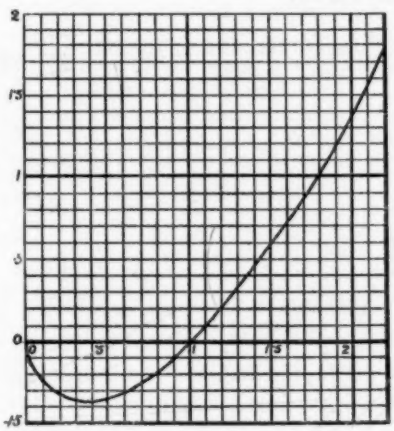
Hence the sum to n terms of the given series is

$$n(n+1)\left\{\frac{2n+1}{6} + \frac{2n(n+1)}{4} + \frac{2n+1}{30}(3n^2 + 3n - 1)\right\}$$

$$= n(n+1)\left\{\frac{2n+1}{30}(3n^2 + 3n - 1 + 5) + \frac{2n(n+1)}{4}\right\}$$

$$= \frac{n}{15}(n+1)(3n^3 + 12n^2 + 13n + 2).$$

Bike.—Find the minimum value of $x \log x$, and graph of the function. (Gibson's *Calculus.*)



Let $y = x \log x$.

Then $\frac{dy}{dx} = \log x + x \times \frac{1}{x} = \log x + 1$.

For maxima or minima values of y,

$$\log x + 1 = 0, \text{ or } \log x = -1.$$

$$\therefore x = e^{-1} = \frac{1}{e},$$

where e is the base of the Napierian logarithms, equal to 2·71828 . . .

$$\frac{d^2y}{dx^2} = \frac{1}{x}.$$

Thus, when $x = \frac{1}{e}$, $\frac{d^2y}{dx^2} = e$, which is a positive value.

Thus $x = \frac{1}{e}$ gives a *minimum* value to $x \log x$.

To find a graph of the function, notice—

(1) When $x = 1$, $\frac{dy}{dx} = \log 1 + 1 = 1$.

Thus the curve crosses the axis of x at an angle of 45°.

(2) When $x = 0$, $\frac{dy}{dx} = -\infty$.

Thus the curve touches the axis of y at $x = 0$.

For $x = 0$, $y = 0 \times \log 0 = 0 \times (-\infty)$. Thus the value of y is indeterminate. To find the value of y, write—

$$y = \frac{\log x}{\frac{1}{x}} \quad \ldots\ldots\ldots \quad (1)$$

Form a new fraction by differentiating the numerator and denominator of (1) separately, and putting the diff. co. of the numerator of (1) in the new numerator, and the diff. co. of the denominator of (1) in the new denominator.

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Then, as x approaches 0, y approaches the value

$$\frac{\frac{1}{x}}{-\frac{1}{x^2}} = -x = -0.$$

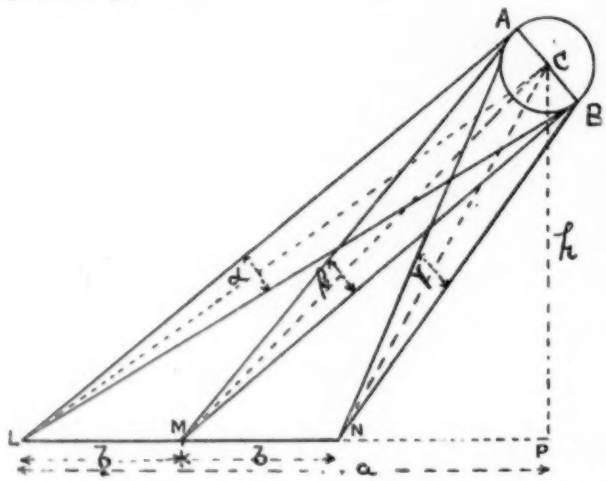
A graph of the function $y = x \log x$ is given in Fig. 1. We can find the numerical values of y for $x = \cdot1$, $x = \cdot2$, $x = \cdot3$, . . . $x = 1\cdot5$, . . . by substituting these values of x in the equation $y = 2\cdot3026 \times x \times \log_{10} x$.

When x is less than 1, we must subtract the positive mantissa from the negative characteristic of $\log_{10} x$. Thus

$$\log_{10} \cdot2 = -1 + \cdot3010 = -\cdot699.$$

Jesse.—A spherical orb on the top of a building subtends to an observer on the level plane an angle a. He walks on the level directly towards it a distance b, and again a further distance b, finding the angles subtended at these positions to be β, γ respectively.

Prove that the radius of the orb is $\sqrt{2}b(\operatorname{cosec}^2 \frac{1}{2}a - 2\operatorname{cosec}^2 \frac{1}{2}\beta + \operatorname{cosec}^2 \frac{1}{2}\gamma)^{-\frac{1}{2}}$.



Let C be the centre of the orb and AB a diameter, L, M, and N the three given points of observation. Join L to A and B; then the angle ALB is a. Similarly, the angle AMB is β, and ANB is γ.

If r is the radius AC of the orb, the angle ALC is $\frac{a}{2}$.

Let h denote the height CP of the centre C, and a the distance LP. Then $LC = \sqrt{a^2 + h^2}$.

$$\therefore \sin \frac{a}{2} = \frac{r}{\sqrt{a^2 + h^2}} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

$$MP = a - b.$$

$$\therefore \sin \frac{\beta}{2} = \frac{r}{\sqrt{(a-b)^2 + h^2}} \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

$$\text{Also } NP = a - 2b.$$

$$\therefore \sin \frac{\gamma}{2} = \frac{r}{\sqrt{(a-2b)^2 + h^2}} \quad . \quad . \quad . \quad . \quad . \quad (3)$$

From (1) $\operatorname{cosec}^2 \frac{a}{2} = \frac{a^2 + h^2}{r^2}$.

,, (2) $\operatorname{cosec}^2 \frac{\beta}{2} = \frac{(a-b)^2 + h^2}{r^2} = \frac{a^2 - 2ab + b^2 + h^2}{r^2}$.

,, (3) $\operatorname{cosec}^2 \frac{\gamma}{2} = \frac{(a-2b)^2 + h^2}{r^2} = \frac{a^2 - 4ab + 4b^2 + h^2}{r^2}$.

Hence we have—

$$\operatorname{cosec}^2 \frac{a}{2} - 2\operatorname{cosec}^2 \frac{\beta}{2} + \operatorname{cosec}^2 \frac{\gamma}{2}$$

$$= \frac{a^2 + h^2 - (2h^2 + 2a^2 - 4ab + 2b^2) + a^2 + h^2 - 4ab + 4b^2}{r^2}.$$

$$\therefore \frac{2b^2}{r^2} = \operatorname{cosec}^2 \tfrac{1}{2}a - 2\operatorname{cosec}^2 \tfrac{1}{2}\beta + \operatorname{cosec}^2 \tfrac{1}{2}\gamma,$$

$$\text{or } r^2 = 2b^2 \div (\operatorname{cosec}^2 \tfrac{1}{2}a - 2\operatorname{cosec}^2 \tfrac{1}{2}\beta + \operatorname{cosec}^2 \tfrac{1}{2}\gamma).$$

$$\therefore r = \sqrt{2}b\,(\operatorname{cosec}^2 \tfrac{1}{2}a - 2\operatorname{cosec}^2 \tfrac{1}{2}\beta + \operatorname{cosec}^2 \tfrac{1}{2}\gamma)^{-\frac{1}{2}}.$$

Lotus.—Kindly explain how, if x be < 1,

$$(1)\ \frac{\sin\theta}{1 - 2x\cos\theta + x^2} = \sin\theta + x\sin 2\theta + x^2 \sin 3\theta + \ldots + x^{n-1}\sin n\theta + \ldots \textit{ad. inf.};$$

$$\text{and } (2)\ \frac{1 - x^2}{1 - 2x\cos\theta + x^2} = 1 + 2x\cos\theta + 2x^2\cos 2\theta + \ldots + 2x^n \cos n\theta + \ldots \textit{ad. inf.}$$

(Loney's *Trigonometry*, Part II., Arts. 48, 49.)

(1) Following the direction given in Art. 48, we multiply each side of the equation by $1 - 2x\cos\theta + x^2$. The L.H. member of the resulting equation is obviously $\sin\theta$, and the R.H. member, when the terms are arranged in order of ascending powers of x, becomes

$$\begin{aligned}&\sin\theta + (\sin 2\theta - 2\sin\theta\cos\theta)x\\ &+ (\sin 3\theta - 2\sin\theta\cos\theta + \sin\theta)x^2\\ &+ (\sin 4\theta - 2\sin\theta\cos\theta + \sin 2\theta)x^3\\ &+ \ldots\ldots\ldots\ldots\ldots\ldots\\ &+ \{\sin(n+1)\theta - 2\sin\theta\cos\theta + \sin(n-1)\theta\}x^n\\ &+ \ldots \textit{ad. inf.}\end{aligned}$$

Since $\sin(n+1)\theta + \sin(n-1)\theta = 2\sin n\theta\cos\theta$, we see that the coefficient of each of the powers of x in the R.H. member vanishes. Therefore, if x be < 1, the R.H. member reduces to $\sin\theta$. Hence the given relation is verified. In the same way equation (2) may be verified.

The following is a more rigorous proof, but it involves a knowledge of the exponential values of the sine and cosine of the angle θ.

To expand $(1 - 2x\cos\theta + x^2)^{-1}$ in a series of powers of x, where x is less than unity, we write this expression in the form $\{1 - x(e^{i\theta} + e^{-i\theta}) + x^2\}^{-1}$, which is equal to

$$(1 - xe^{i\theta})^{-1} \cdot (1 - xe^{-i\theta})^{-1}.$$

This, expressed in partial fractions, is equal to

$$\frac{1}{e^{i\theta} - e^{-i\theta}}\left(\frac{e^{i\theta}}{1 - xe^{i\theta}} - \frac{e^{-i\theta}}{1 - xe^{-i\theta}}\right)$$

$$= \frac{1}{2i\sin\theta}\left(\frac{e^{i\theta}}{1 - xe^{i\theta}} - \frac{e^{-i\theta}}{1 - xe^{-i\theta}}\right),$$

which, on expansion in powers of x, becomes

$$\frac{1}{2i\sin\theta}(e^{i\theta} + xe^{2i\theta} + x^2e^{3i\theta} + \ldots + x^{n-1}e^{ni\theta} + \ldots)$$

$$- \frac{1}{2i\sin\theta}(e^{-i\theta} + xe^{-2i\theta} + x^2e^{-3i\theta} + \ldots + x^{n-1}e^{-ni\theta} + \ldots);$$

and this is equal to

$$\frac{1}{\sin\theta}(\sin\theta + x\sin 2\theta + x^2\sin 3\theta + \ldots + x^{n-1}\sin n\theta + \ldots \textit{ad. inf.}).$$

Hence $\dfrac{\sin\theta}{1 - 2x\cos\theta + x^2} = \sin\theta + x\sin 2\theta + x^2\sin 3\theta + \ldots + x^{n-1}\sin n\theta + \ldots \textit{ad. inf.}$

Similarly the relation given in Art. 49 may be established.

Molim.—Eliminate x, y, z from the equations—

$$p = ax + cy + bz \quad . \quad . \quad . \quad . \quad (1)$$
$$q = cx + by + az \quad . \quad . \quad . \quad . \quad (2)$$
$$r = bx + ay + cz \quad . \quad . \quad . \quad . \quad (3)$$
$$x^2 + y^2 + z^2 = yz + zx + xy \quad . \quad . \quad . \quad . \quad (4)$$

(Cambridge Entrance.)

From (1), (2), and (3) we have, by addition—

$$(a + b + c)(x + y + z) = p + q + r \quad . \quad . \quad . \quad (5)$$

Also, on squaring (1), (2), and (3), we have—

$$p^2 = a^2x^2 + b^2y^2 + b^2z^2 + 2(caxy + bcyz + abzx),$$
$$q^2 = c^2x^2 + b^2y^2 + a^2z^2 + 2(bcxy + abyz + cazx),$$
$$r^2 = b^2x^2 + a^2y^2 + c^2z^2 + 2(abxy + cayz + bczx).$$

$$\therefore p^2 + q^2 + r^2 = (a^2 + b^2 + c^2)(x^2 + y^2 + z^2) + 2(ab + bc + ca)(xy + yz + zx).$$

Hence, and from (4)—

$$p^2 + q^2 + r^2 = (a + b + c)^2(x^2 + y^2 + z^2) \quad . \quad . \quad . \quad . \quad (6)$$

But $(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$.

$\therefore$ from (4)—

$$(x + y + z)^2 = 3(x^2 + y^2 + z^2).$$

$\therefore$ from (5)—

$$(a + b + c)^2 3(x^2 + y^2 + z^2) = (p + q + r)^2 \quad . \quad . \quad (7)$$

Then from (6) and (7) we have—

$$3(p^2 + q^2 + r^2) = (p + q + r)^2.$$
$$\therefore p^2 + q^2 + r^2 = pq + qr + rp.$$

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PHYSIOGRAPHY.

(ADVANCED AND HONOURS.)

Ocean Waves.—In a recent lecture at the Royal Geographical Society, Mr. Vaughan Cornish dealt in an interesting manner with this fascinating branch of physiographic science. During storms, waves with periods of from 8 to 11 seconds were observed with lengths from 328 to 620 ft., while a 10-second wave was 512 ft. long. The sides of these waves had an average slope of not less than 1 in 10. A set of such waves would have a height of about 25 ft.; but there was generally a swell running at the same time, which increased the total rise and fall of the water. It made the waves irregular, and caused waves of much greater height than 25 ft. to occur not infrequently. When, after a storm, the shorter waves had become no steeper than the swell, it was the swell that became in its turn the conspicuous thing at sea, and, instead of wave crests separated from one another as far as the two ends of Burlington Gardens, we had commonly a wave of about 15-seconds period, with 1,150 ft. between the ridges.

Magnetic Observations and the Solar Eclipse.—To further test the results obtained by the United States Geodetic Survey magnetic parties during the solar eclipse of May 28, 1900, regarding a slight magnetic effect that may be due to some change in the electrification of the upper atmospheric strata by the abstraction of the sun's rays, an appeal was made for international co-operation in magnetic observation during the eclipse of 1901.

The Response to the Appeal.—In response to the appeal, simultaneous magnetic observations were made on May 17, from 14 to 21 o'clock, Greenwich mean astronomical time. At Karang Sayo (Dutch section) a change in the magnetic declination and horizontal intensity was observed. At Sawah Loento (Massachusetts section) the variations in magnetic declination were observed by Mr. G. L. Hosmer on May 17 and 18. From Mauritius Magnetic Observatory, Mr. Claxton states that "the original curve shows slight tremors between 7.15 and 7.50, and occasionally between 8.5 and 9 A.M."

The other stations noted no extraordinary effect; but still, as Mr. L. A. Bauer, the originator of the question, says, the investigation is of fundamental importance in its possible relation to the theory of the diurnal variation of the earth's magnetism.

Meteorology in 1901.—On comparing the principal meteorological results for 1901, at Greenwich, with those for the last sixty years, the mean temperature (49·6°) is seen to be 0·5° under the average; the maximum was 87·9° on July 19, the minimum 20·4° on February 14, thus giving an absolute range of 67·5°. As in previous years, the rainfall was below the average, the deficit being 3·28 inches. During March and April there was a slight excess, and a large excess of 1·74 inches in December. Deficits of more than an inch were recorded in January and November.

The amount of bright sunshine recorded was in excess of the mean for the last twenty years by 290 hours; the highest record occurred in May, when 237 hours were recorded, and the lowest in February, which fell to 27 hours.

The Amount of Gravitational Matter in Interstellar Space.—Lord Kelvin recently read a paper on the above subject, in the course of which he said that his consideration was limited to gravitational or ponderable matter, because he had now become convinced that there did exist matter which was not subject to Newton's law of gravitation. This matter was not molar, as ponderable matter was, and was what was generally called ether. From a consideration of a famous and far-reaching theorem of Green, the famous self-taught son of a Nottingham miller, published in 1828, he had convinced himself that there was not more than a certain amount of ponderable matter. This would include all the suns, stars, meteoric dust, etc., included in that space. Taking a spherical space, two hundred million times the sun's distance from the earth, he calculated that the total ponderable matter contained within it did not exceed more than one thousand million times the mass of the sun.

Coronal Disturbance.—The following note from *Knowledge* for April will be of interest:—"An interesting feature of the solar eclipse of May 18, 1901, was a disturbance of the coronal structure in the neighbourhood of a prominence. Mr. Perrine, of the Lick Observatory, has recently examined photographs of the sun taken at Dehra Dûn on several days just before and after the eclipse, and it results that a spot, which came into view on the 19th, was, at the time of the eclipse, on the farther side of the sun, and about 4° from the limit. The spot was surrounded by faculæ, and it is considered that the spot, faculæ, prominence, and coronal disturbance had probably a common origin. That the action which produces a spot may exert an influence on the coronal streamers in its immediate neighbourhood seems sufficiently probable, but it does not follow that the streamers owe their origin to the same disturbances which cause the appearance of spots."

The Frost of February.—Dr. H. R. Mill has devoted attention to this, and reports in the *Meteorological Magazine* as follows:—"With the exception of the long-continued cold of February 1895, this frost was the most prolonged and severe that has been experienced in February for half a century." He measures the duration of the frost by the number of nights during which the temperature in the shade fell below freezing-point. In most places the cold weather set in on the 1st, and, generally speaking, lasted for three weeks, except on the sea-coasts. For example, at Torquay the period was nine days; at Eastbourne and some other places, twelve days only; while in Suffolk, Yorks, and Peebles the duration was twenty-four days. The lowest shade temperatures were – 2° at Lairg (Sutherland) and 0° at Braemar on the 14th. At Camden Square the minimum was 15·8°, the only lower records there in February being 15·4° in 1865 and 7·3° in 1895. The mean temperature of the month appears to have been from 3° to 5° below the average in all parts of our island.

CHEMISTRY.

(ADVANCED AND HONOURS.)

BY T. CARTWRIGHT, B.A., B.SC.

Aldehydes and Acids.—If about half a gram of platinum-black, moistened with alcohol, is placed in a watch-glass, and a bell jar, slightly tilted on one side (to allow of the entrance of air), is placed over it, and a piece of blue litmus is placed in contact with the platinum, there will be noticed first of all a pleasant odour, followed later on by the reddening of the litmus, because of the appearance of an acid. The pleasant odour proceeded from aldehyde, which may also be prepared by the action of dichromate of potash and sulphuric acid (which yield oxygen) on alcohol, and the acid that comes later may be proved to be acetic acid by heating the watch-glass, when a distinct smell of vinegar is noticed. The aldehyde is thus produced—

$$C_2H_5OH + O = CH_3CHO + H_2O;$$

that is, the alcohol loses two atoms of H, which go to form water with the O (got from air in the platinum-black experiment, and from the mixed dichromate and H_2SO_4 in the second place). Hence the name, which means alcohol dehydrated (alcohol

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dehydrogenatum). When acted upon with PCl_5, phosphoryl chloride is produced, but there is no sign of HCl; in other words, the Cl displaces the O, and not O and H in combination, in the form of hydroxyl. Thus—

$$CH_3CHO + PCl_5 = CH_3CHCl_2 + POCl_3.$$

This shows that there is no hydroxyl in aldehydes, hence we write CH_3CHO, and not CH_2COH. Aldehyde is prepared in bulk as follows: 120 grams $K_2Cr_2O_7$ are put in a two-litre flask connected with a dropping-funnel, and a Liebig's condenser sloping upwards instead of downwards; 160 grams H_2SO_4 are mixed with 480 grams water and 120 grams ethyl alcohol, which when cooled is dropped slowly upon the $K_2Cr_2O_7$, and the flask is heated in a water bath. The aldehyde is passed into ether, into which is passed afterwards a current of NH_3, with which the aldehyde unites to form crystals of aldehyde ammonia, from which the aldehyde can be separated by means of H_2SO_4. Besides combining with NH_3, aldehyde unites with HCN, with $KHSO_3$, and many other substances.

Acetic acid is prepared commercially by the agency of an organism called mother of vinegar, which conveys the oxygen from the air to the alcohol, just as in the case of the platinum-black. The reaction is brought about by running beer or wine over bench shavings. The acid may also be prepared by the oxidation of alcohol, as already shown,

$$C_2H_5OH + O_2 = CH_3CO_2H + H_2O, \text{ or}$$
$$(a)\ C_2H_5OH + O = CH_3CHO + H_2O,$$
$$(b)\ CH_3CHO + O = CH_3CO_2H.$$

Its preparation by the oxidation of aldehyde is shown thus:—

$$C_2H_4O + O = C_2H_4O_2, \text{ or } CH_3CHO + O = CH_3COOH.$$

It is obtained commercially by the distillation of wood.

The presence of the OH group is proved in the usual way—namely, by acting upon it with PCl_5 when a Cl atom replaces an OH group. Thus—

$$CH_3COOH + PCl_5 = CH_3COCl + POCl_3 + HCl.$$

The presence of methyl, CH_3, is proved by the fact that Cl can be substituted for the H, just as in the case of methane, CH_4, giving such bodies as CH_2ClCO_2H, $CHCl_2CO_2H$, CCl_3CO_2H, hence the constitutional formula $CH_3C\begin{matrix}O\\OH\end{matrix}$. The properties and the salts of the acid must be studied from text-books.

If sodium ethylate is acted upon by ethyl iodide, the following change results:—

$$C_2H_5ONa + C_2H_5I = (C_2H_5)_2O + NaI.$$

This body is the well-known ether, which is usually prepared by acting upon ethyl alcohol C_2H_5OH with H_2SO_4, when the following changes take place:—

$$C_2H_5OH + H_2SO_4 = C_2H_5HSO_4 + H_2O.$$
$$C_2H_5OH + C_2H_5HSO_4 = (C_2H_5)_2O + H_2SO_4.$$

This oxidation product of the hydrocarbons is a typical body, and a member of another series of homologous bodies, of which we have now studied (1) the hydrocarbons, (2) the substitution products of these bodies, (3) the aldehydes, (4) the acids, and (5) the ethers. By reduction an acid becomes an aldehyde. Thus—

$$CH_3CO_2H + H_2 = CH_3CHO + H_2O.$$

And so we have illustrated substitution, oxidation, and reduction, and will now conclude with a note as to hydrocarbon residues or radicals.

Methyl, Ethyl, etc.—It will have been noticed that each hydrocarbon appears to be the hydride of a group of C and H atoms that hold together somewhat tenaciously, entering freely into combination, and being expelled from combination without heating up. Thus CH_3 is the underlying group of methane, and C_2H_5 of ethane, etc., so that we might well write these bodies thus: CH_3H, C_2H_5H.

This radical is to carbon compounds what the metals are to mineral compounds; and the student will do well to compare the following, and to firmly grasp the underlying similarity, as brought out by their behaviour towards reagents:—

CH_3	CH_3OH	CH_3HSO_4	$(CH_3)_2O$	$CH_3CO\underline{OH}$.
Na	NaOH	$NaHSO_4$	Na_2O	$SO_2\underline{(OH)_2}$.

It is a firm grasp of these real resemblances that makes the study of the carbon compounds so highly interesting, as giving the intellectual pleasure which comes from the unexpected discovery of likeness in difference.

Qualitative Analysis.

Group I.— + HCl, boil (Pb diss.) + NH_4OH to ppt. (Ag dis. Hg compound black).

,, II.— + H_2S to ppt. + $(NH_4)_2S$: ppt. = Group II. (*a*); filt. = Group II. (*b*).

,, II. (*a*)— + HNO_3(Hg ins.) + H_2SO_4(Pb) + NH_4OH(blue colour = Cu) + KCN + H_2S(Cd).

,, II. (*b*)— + HCl and digest ppt. with $(NH_4)_2CO_3$ (lumps) (As dis.). Dis. ppt. = Sn + Sb in HCl. Sn on Zn. Sb on Pt.

,, III.— + NH_4Cl + NH_4OH to ppt. + Na_2O_2 (Cr and Al dis.): ppt. = Fe; Cr (yellow) + HNO_3 to neutralise + NH_4OH (Al = white ppt.) dis. Fe in HCl + KCNS (red colour).

,, IV.— + $(NH_4)_2S$: dis. ppt. in HCl + $KClO_3$: + NaOH excess (Zn remains in solution): dis. ppt. in HCl + Am. Acet. + H_2S, filter (ppt. = Ni + Co). Filtrate = Mn dis. ppt. in HNO_3 + HCl; + KCN excess (Ni = white ppt.). Test Co bead.

,, V.— + $(NH_4)_2CO_3$: Dissolve ppt. in acetic + K_2CrO_4(Ba) + H_2SO_4(Sr) + Am. Ox. (Ca).

,, VI.— + Sod. Phos. (Mg); + Tartaric (K); Flame (Na).

Group III. when Phosphates are present:—
+ HNO_3 to part + KCNS (Fe). To other part + NH_4OH.
dis. ppt. in HCl + Sod. Acet. + Fe_2Cl_6.
ppt. = Group III. Filtrate = Groups IV. and V.

Acids:— + HCl detects H_2CO_3; H_2SO_3; H_2S; H_4SiO_4; HNO_2.
+ H_2S detects $H_2Mn_2O_8$; H_2CrO_4.
+ H_2SO_4 detects H_2CO_3; H_2SO_3; H_2S; HNO_2; HCl; HBr; HI; HF; $HClO_3$.
+ HCl + $BaCl_2$ (to sol.), H_2SO_4 white ppt.
+ $AgNO_3$ to sol. detects HCl white ppt.; HBr (yellowish white); HI (yellow).
+ H_2SO_4 + Methy. Spirits. Green flames = Borate.
+ HNO_3 + Am. Mo. = Phosphate = yellow ppt.
+ Cu + H_2SO_4 = Nitrate (brown fumes). $FeSO_4$ + H_2SO_4 + HNO_3 (brown ring).

SCIENCE NOTES.

NEW STARS OR NOVÆ.

During two thousand years about thirty of these have appeared, and with three exceptions they have all been in the neighbourhood of the Milky Way. The latest star of this type appeared in the constellation of Perseus, about February 20, 1901. It was invisible on February 19, and by the 23rd it was the brightest star north of the equator. After this date it rapidly decreased in brightness, falling to a fourth magnitude star by March 13. Thence till the end of March it varied in brightness between magnitudes 4 and 5·5, the variations being regular, and exhibiting a period of three days. During April the periods lengthened to five days, and later the fluctuations ceased, the star becoming fainter, until in September it reached 6·7 magnitude. (See *Nature*, August 1, 1901, for light curve.)

Photographs of the star taken on August 20 showed it to be surrounded by an aureole, which was at first attributed to faults in the lenses of the telescope. The aureole has, however, increased, and the star now appears to be surrounded by a nebula with well-marked condensations, which in the latest photographs present a spiral arrangement around the nova.

In explanation of the apparent increase of the nebula, Professor Kapteyn and W. E. Wilson have independently suggested that it may be due to the light emitted by the nova spreading outwards in every direction with a velocity of 186,000 miles per second, and thus illuminating more and more of the meteoric matter in the neighbourhood. If this be correct, the actual diameter of the visible part of the nebula can be obtained by finding the distance through which light would have travelled since the new star came into existence, and doubling it. By a comparison of the observed diameter of the nebula and its actual diameter obtained in this way, its distance has been calculated to be about two hundred and fifty light-years.

Great interest was aroused in this nebula in consequence of a comparison of photographs taken on September 20 and November 7, which showed a change in position of the best defined condensations. The apparent changes in position were so great that, allowing the nova to be only 6·5 light-years distant from the earth, to produce them, moving parts must have travelled

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The spectrum of the new star on February 23 was a continuous one, in which, with high power, a few dark (Fraunhofer) lines were discernible. By the next day both dark and bright lines were visible, the principal dark lines having accompanying bright bands of slightly greater wave length—that is, on the side nearest the red end of the spectrum. Such a spectrum had been previously observed in other new stars, such as Nova Aurigæ (1892), and points to the light having been emitted by two separate sources, one producing the dark lines, the other yielding bright lines, of such substances as hydrogen, helium, asterium, and calcium. The middle portions of the bright lines occupied about the normal position in the spectrum. The dark lines produced by similar substances, instead of being coincident with the bright lines, were displaced a little towards the violet—that is, were of shorter wave length—which points to their production by a substance moving rapidly towards the earth. By measuring the distances between the corresponding bright and dark lines in the spectrum of Nova Persei, the velocity of one light source relatively to the other was found to be 700 miles per second.

The continuous spectrum grew weaker, and the bright lines became stronger, until by the middle of May the star gave a typical nebular spectrum, the hydrogen lines being very bright and clear. Later, these hydrogen lines, together with the enhanced lines of iron and magnesium, have weakened and given place to lines indicating the presence in the new star of substances at present unknown on the earth.

Various theories have been put forward to explain the production of new stars—for example, explosions of solid globes, volcanic eruptions on previously dark bodies, worlds on fire, etc. It is necessary to explain two of the more recent hypotheses:—

1. **The Meteoric Hypothesis** of Sir Norman Lockyer, according to which a new star is the result of the violent clashing of two previously invisible swarms of meteorites, or the rush of one such swarm through a previously unnoticed nebula. This indicates a reason for the presence of so many novæ in the Milky Way, where nebulæ are known to be most abundant. It is also possible by this hypothesis to explain the variations in brightness of the star. The nebula may have been invaded by a succession of meteoric streams, the initial one, which was also the most violent, producing the nova itself, and several minor invasions in various parts of the nebula producing, besides increases in brightness, the so-called condensations in different positions at different times. Thus the incredible velocity of translation of the brighter condensations can be explained as being merely apparent. The spectroscope also supports the hypothesis by its evidence of motion in opposite directions.

2. **The Grazing Contact Hypothesis** put forward by Professor A. W. Bickerton. New stars are said to arise by the partial impact of two solid globes, which graze one another in passing. The grazed portions become immensely heated, and therefore give out light. The portions removed from the two colliding bodies become converted by the heat into luminous gas, which increases in volume and envelops the bodies in a haze or nebula. The hypothesis, though explaining the principal phenomena, is not entirely satisfactory.

THE CAUSES OF CLIMATIC CHANGES, WITH SPECIAL REFERENCE TO THE ICE AGE.

Many and various causes have been suggested to account for the changes in temperature which produced, interrupted, and terminated the glacial period. None of these are completely satisfactory, but, on account of the light they throw on the causes of changes in climate, they are worth notice. They may be divided roughly into astronomical, geographical, and meteorological groups.

I. Astronomical Causes.

1. *Form of the Earth's Orbit.*—Dr. Croll and others think that the glacial period was due to an elongation of the earth's elliptical orbit, and consequent eccentricity of the sun. When the northern winter occurred at aphelion (when the earth was farthest from the sun), the short hot summer would be insufficient to melt the snows which had fallen during the long cold winter, and the land would become buried under the accumulated snows of many winters. The southern hemisphere would at this time enjoy long cool summers and short mild winters. This state of things would, however, be reversed every 12,900 years, owing to the precession of the equinoxes, the southern hemisphere becoming glaciated, and the northern enjoying a more equable climate.

2. *Obliquity of the Ecliptic.*—Increase of the inclination of the earth's equator to the plane of the ecliptic would widen the torrid zone, and also increase the area of the earth's surface which receives no heat from the sun during the winter. On the contrary, a decrease of the obliquity would produce a more equable climate over the whole globe.

3. *Other Hypotheses.*—The varying temperature has by some been ascribed to variations in the amount of heat radiated by the sun, and even to changes in the temperature of the space through which the earth has passed.

II. Geographical Causes.

1. *Subsidence of the land*, by varying the shape and extension of the continents, may have given such a direction to glacial currents that they produced extreme cold in one part of the earth or another. It may also have completely changed the direction taken by the warm ocean currents which are so powerful in modifying climate—for example, the Gulf Stream.

2. *Elevation of the land* may have lifted the surface above the snow-line. It is generally accepted that a lowering of the snow-line by 1,000 metres would produce another ice age; and it is also agreed that for Britain to be glaciated, the channel between Iceland and Great Britain must have been closed or blocked by ice, thus preventing the ingress of the warm Gulf Stream to the Arctic Ocean, in which it at present exerts an influence as far north as Nova Zembla. A submarine ridge runs from the British Isles to Greenland by way of Iceland which would be completely uncovered by an elevation of 2,000 feet, while half that rise would limit the communication between the two oceans to a few shallow channels which might easily be blocked by icebergs.

3. *Other causes* have also been suggested, such as changes in the internal heat of the earth. It may be noted here that variations in the vegetation covering a tract of country have a powerful influence on the climate, but probably not sufficient to account directly, at any rate, for the glaciation of an area.

III. Meteorological Causes.

1. *Absorption of Heat by the Atmosphere.*—Messrs. Paul and Fritz Sarasin have recently suggested that the sun's rays may have been obscured during the glacial epoch by the dust thrown into the air by the abnormal burst of volcanic activity which immediately preceded it. Professor T. C. Chamberlin and Dr. Niks Ekholm drew attention last year to the view that the quantity of carbon dioxide in the atmosphere would alter its absorption of heat rays. Both carbon dioxide and water vapour are transparent to bright heat rays, but absorb, and therefore radiate, dark heat rays—that is, the bright heat rays of the sun can reach the earth and warm it, but the dark heat waves, radiated by the warm earth, are absorbed by the carbon dioxide and water vapour, and partly radiated back again to the earth. Hence a decrease in the amount of either substance in the atmosphere would produce a cooling influence on the earth by allowing a greater amount of heat to radiate into space. For countries in latitudes 40°–50° to become glaciated, it is calculated that the average temperature must be lowered 4°–5° C., which could be brought about by a decrease in the quantity of carbon dioxide in the air to 0·62–0·55 of its present value. On the other hand, to increase the temperature by 8°–9° C. in the Arctic Regions, the carbon dioxide would have to be increased to 2·5–3 times its present amount. (*Philosophical Magazine*, April 1896.)

2. *Prevalent winds* have, according to some, a predominant influence on climate. Mr. W. F. Harmer has recently studied the causes and influence of high and low pressure areas, and placed his results before the Geological Society (*Quart. Jour. Geol. Soc.*, August 12, 1901). His conclusions are:—

(1.) That winds are very powerful, if not pre-eminent, factors in the production of temperature.

(2.) Anticyclones, or areas of high pressure, will predominate over cold areas, such as permanent ice sheets, continents in winter, and oceans in summer.

(3.) Cyclones, or areas of low pressure, will be commoner over oceans in winter and continents in summer.

(4.) Since both cyclones and anticyclones consist of rotary movements of the air, cold northerly winds on one side of an area will have complementary warm southerly winds on the opposite side.

(5.) Hence such an arrangement of high and low pressures as would produce prevalent cold winds, and consequent glaciation of North-Western Europe, would cause warm winds to blow over the eastern parts of North America. The latter winds might also divert the warm surface currents in the North Atlantic from European to American shores. Similarly, an ice sheet over North America would produce cold winds over England.

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Important to Scholarship, Certificate, and London Matriculation Students.

We should like to specially direct the attention of our readers to the fact that the Board of Education, in the Syllabuses for the Scholarship and Certificate Examinations 1901 and 1902, requires "no set books" for French and German. Students preparing for these examinations, as well as students for London Matriculation, could not do better than attempt month by month the pieces set for translation here. They are from the best authors, and of varied character. A competitor who does not gain a prize can derive considerable benefit from the exercise. A study of the successful competitor's translation, and of our remarks, will help him to see where he might have done better. If desired, his paper can be returned (fully corrected) by enclosing six stamps together with a stamped and addressed envelope. Corrected papers cannot be posted until after publication of the journal.—ED.

RULES.

1. All translations should be **posted not later than May 8,** and addressed:—*Prize Editor*, Office of THE PRACTICAL TEACHER, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the Coupon which appears on the Back Wrapper page of the current number.
3. Competitors should adopt a pseudonym, and send name and address written on a separate piece of paper.
4. No competitor may take the prize offered more than once in three months.

FRENCH PRIZE COMPETITION.

A Prize of One Guinea will be given for the best translation into English of the following extract:—

L'histoire de France est, aussi, une grande école d'optimisme. Ce pays s'est souvent trompé; il a fait beaucoup de fautes; il a beaucoup souffert. Mais, tout de même, voilà quinze cents ans qu'il tient. On verra bien, les autres.....Lui, malgré tout, à travers tout, il vit, survit, sourit. Décadence, dit-on. Singulière décadence! Ce peuple reste vaillant, laborieux et généreux, et il lui arrive encore de faire les frais des grandes expériences pour le reste de l'humanité. Il est parfois si fou, qu'on le croirait toujours jeune. La difficulté de mon sujet, c'est sa grandeur. Parler de la France, quelle entreprise! Mais, n'ayant nullement la prétention d'être didactique, j'ai suivi, tout bonnement, le hasard de mes rencontres et de mes impressions. J'ai dit ce que je voyais, ce qui me frappait, ce qui m'amusait. Si l'on me faisait le reproche d'être incomplet, j'aurais grande envie de le prendre pour un éloge. On verra aussi que j'ai été sobre de critiques. On a dit tant de mal de notre pauvre pays que j'ai pris plaisir à en dire du bien. Ce pays a ses défauts et ses vices: il faut travailler à les corriger—en commençant, bien entendu, chacun par soi-même. Mais je ne me suis pas senti le goût d'assombrir, par d'amers reproches, la belle humeur et la joie de vivre d'un peuple confiant et bon enfant.

GABRIEL HANOTAUX.

RESULT OF THE GERMAN PRIZE COMPETITION.

The prize of half a guinea is awarded to "La Printanière," the pseudonym of Miss Evelyn A. Cowan, 30 Gauden Road, Clapham, S.W.

First Class.—C.E.M., Polly, Thrums, Hundafott, Agaznog, Ethik, Ouard, Enfant terrible, Little Dorrit, Myosotis, Marzavan, Kath, Acorn, Esto quod videris, Jungwolfia, Rustica, Isolde, Day Dawn, Dinah, Hajji Baba, Katie, Haldane.

Second Class.—Primrose, Marianna, Coralie, Kitaitz.

Third Class.—Morganwg.

Disqualified.—Rule 3: Sigurd.

Report.

The quality of the translations sent in is sufficiently indicated by the large proportion of those who are placed in the first class. With the exception of the quaint translation of *edel* by "high-minded," the successful competitor has sent in a very good rendering of the extract. What mistranslations I came across were fairly well spread over the whole of the piece. The only case in which several competitors found the same difficulty was in the translation of the adjective in the phrase *abweichende Gedanken*. Such obviously unfitting translations as "anomalous" and "divergent" were given. It is much to be regretted that so few entered for this competition. We feel sure that the number of competitors this month is by no means a guide to the number of our subscribers who are studying German. We take considerable pains to select for translation extracts representative of the very best which German and French literature can produce, and, as many of our competitors gratefully acknowledge, the continual practice afforded by our competition does much to cultivate a good style in English.

We regret that the translation sent in by "Aikona," from Salisbury (Rhodesia), posted on 7th February, arrived after the report on the Foreign and Colonial Competition had been sent in.

German Prize Translation.

The stepmother asks herself in great distress how this comes about, and she can find no answer. Poor woman! diligently and indefatigably do you weave your web of love round the heart of the child entrusted to you, not knowing that behind your back sits a wicked Penelope always undoing at night what you have woven during the day! To begin with, there are the first wife's relations: in their devotion to the dead they forget the consideration due to the living; as often as the child comes to them he hears himself pitied, commiserated, wept over; they speak to him of his mother, not of the new one, for she certainly is not that, but of his own mother, and say how very differently *she* would have loved him, how very differently *she* would have treated him; they ask him about the stranger's doings, how she treats him, and if she is unkind to him. Then there are servants, governesses, foolish strangers, who, partly to ingratiate themselves with the child, partly out of a miserable sentimentality, seeming to believe it to be high-minded and kind-hearted when they turn up their eyes in pity where there is nothing to deplore, repeat the same thing to the child morning, noon, and night. He never hears himself called anything but "poor child!" "poor orphan!" He is taught that he is telling a lie when he calls the stepmother "mamma." All this will lead to spying, to dissimulation; the frankness and ingenuousness of the child are taken from him, and he becomes accustomed to look for hidden meanings in the stepmother's words, and to impute unfriendly motives to her actions.

"LA PRINTANIÈRE."

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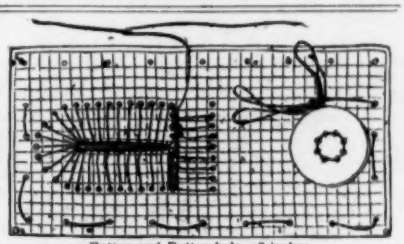

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THE EDITOR'S TABLE

NELSON'S NEW DRAWING COURSE.

TO argue the value of drawing as a factor in elementary education has become a work of supererogation. Every one assents to the obvious. But there is less unanimity when it becomes a question of how drawing should be taught, to what extent it should be carried, whether it should be an end or merely a means to an end, and lastly, whether it should stand alone or be made to fit into a well-rounded scheme of education.

These are points about which there can never, in the nature of things, be complete accord. Circumstances must necessarily influence judgment, so that the method that may appear right in London meets with no favour in Philadelphia. The time to be devoted to drawing must also vary somewhat, according to the nature and aims of a school. Anything like a fixed time can be assigned only to the elementary classes. And drawing has suffered much in the past from the too zealous enthusiasts who have made it appear as the be-all and end-all of school life. To-day saner counsels prevail, and while drawing as a training to appreciate the artistic and beautiful still has its old value, it has begun to be seen that drawing may readily be one of a group of subjects which together, mutually assisting, afford fuller means of mental development.

It is not, therefore, surprising to find that the methods of, say, ten years ago are beginning to falter, and that the subject has considerably widened its horizon. The conventional copy drawn in the first place from some debased Renaissance ornament is no longer the only thing to which the children are taught to look forward when the drawing lesson comes round. It has been found that while lines quite as good can be used in the drawing of natural leaves or objects of everyday use, the children are infinitely more interested in drawing a violet leaf than in making a bad copy of a Greek anthemion which has to them neither use nor beauty.

Apart from this "natural bias towards nature," the child delights in things concrete and tangible; and if he can not only draw a leaf, but may also cut out its shape in paper or model it in clay, he gets an added delight. Co-ordination is become a common cry in modern education, and has influenced the teaching of drawing, as of most other subjects.

In response to this call teachers have been experimenting on all hands. Naturally there are diversities of opinion. In America, for instance, one well-known teacher believes implicitly in facility of hand and in swiftness of execution rather than in accuracy of result, maintaining that experience will rectify faults. The same teacher makes these simple exercises the basis for a training in the use of the brush, in clay modelling, and finally in wood-carving. But while there is much that is excellent in such a system, it has become almost a truism in England—rightly or wrongly—that accuracy must be the rock-bed upon which to found any system that claims to train rigidly both the hand and the eye.

Speaking by the book, it is only necessary, we think, to point to the custom of past ages, when the great artists were not merely the draughtsmen and designers, but were also the sculptors and carvers carrying out their ideas in marble, wood, or metal. There is overwhelming evidence to prove the severity of the training which the young artist of past times went through during his apprenticeship. No one insists that every exercise of the child should be rigidly correct. He may be left fancy free to draw houses, trees, or animals; and very often in these freer moments the child discovers his bent, and shows the watchful teacher upon which lines he may be best brought to advance in art. But, generally speaking, there seems little doubt that during the set lesson accuracy should be insisted upon.

This seems to be the idea also of Mr. Vaughan, who in this excellent course has formulated a scheme which is thoroughly in line with modern ideas. As former art master under the London School Board, Mr. Vaughan had abundant opportunity of putting his methods to the best of all tests, experience, and it is no doubt as a result of many experiments, failures, and successes that this well-developed and carefully-graduated scheme has been drawn up.

Mr. Vaughan recognises that teachers, however willing, are not experts, and cannot be expected to evolve for themselves a satisfactory course to run through the standards; but while he comes to the assistance of the teacher, he is anxious to insist that the examples he prints should be merely suggestive—hoping to provide rather a guide than a mechanical aid.

The *New Drawing Course* from the first recognises the importance of accurate drawing. But even when the copy consists of straight lines, it is made interesting to the child. Here are arrows, tables, stools, dominoes, picture-frames, and flags. And this is typical of the course. It would be a very dull child that could find no pleasure in such drawing lessons. For when curves are introduced, there is a profusion of copies that must be delightful to the child. But side by side with these exercises in free-drawing, Mr. Vaughan provides what he terms "pattern work," in which the children have the use of squared paper. On such a basis an infinite number of patterns can be drawn, and children will be found to derive pleasure from devising their own designs. The exercise is, indeed, a valuable introduction to the making of pattern by repetition.

After a time this squared paper is discarded, and the child is taught to make the necessary squares by means of ruler and pencil.

Every one who has had any dealings with children knows how delightful it is to the ordinary boy or girl to dabble with colour. But here again the teacher comes in as a directing agent, helping the child not merely to observe colour and to use the brush, but to apply this knowledge carefully and with a set purpose.

And there are many simple exercises which give most effective results, and can be done by the smallest children. Yet in doing them there must be patience and care on the part of the pupil, preparing him for advanced work where these virtues are all-important.

In schools where there are facilities for the subject, clay modelling may be introduced to carry out the scheme fully. Perhaps nothing more interests the child than the making of clay models. At first, however, in these set lessons, he must learn the nature of the clay, its consistency, and the many admirable qualities which fit it for receiving impressions. At the same time he may be putting this new knowledge to a good use. Mr. Vaughan takes him by the hand and shows him how to make simple patterns by pressing the thumb along the face of the clay, and afterwards leads him to make pellets, rings, and a host of wonderful things.

As the child gets older he learns pattern and design by the aid of coloured paper, which he cuts accurately and fastens carefully upon a sheet. Mr. Vaughan steers clear of those minute patterns which, admirable as they may have been as a test of patience, could hardly be justified as exercises in school, where time is limited. The patterns he selects are broad, and of simple yet good form.

We think there cannot be two opinions as to the value of such a course as this. From the first the child is taught to be accurate, to appreciate form in an interesting manner, and to learn the value of pattern and design. One reason why the old craftsmen of the ancient guilds of carvers and goldsmiths were so excellent in their work was undoubtedly this—they not only designed the figures, but they carried them out in the material. In this *New Drawing Course* the child is encouraged to do the same. He learns to draw a simple form, and later we find him either repeating this in line as a pattern, or cutting out some similar form to apply as a frieze or other border. Not only does the child make patterns with the brush, but he is encouraged to gather leaves and flowers, and to record their shapes simply.

Mr. Vaughan does not forget the difficulties of the teacher with *the class* rather than with the individual. He does not attempt anything that the earnest teacher, without any special knowledge of art, could not accomplish.

It would be difficult to draw up a course that would be more interesting to children and teacher alike, and which would, at the same time, be of equal educational value. For it aims not merely at teaching drawing, as the modest title would suggest. It aims at co-ordinating the training of both hand and eye, so that the hand carries out what has been intelligently observed and put down beforehand in set terms of line and colour.

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A few words should be added in praise of the way in which the publishers have set out the work. In colour, line, and tasteful get-up these charts are a distinct advance upon the flimsy sheets, badly printed, with harsh woodcut lines, so often associated with the ordinary drawing-sets.

Mr. Vaughan's interesting handbooks, too, are full of illustrations suggestive and helpful to the teacher who takes up the subject of drawing and manual training in earnest.

E. J. ARNOLD AND SON.

The A.L. Water-Colour Work. By Alice Wood and Edith Kershaw. In the preface the authors say, "For a long time teachers have felt that brush drawing, however successfully it was taught, 'led nowhere;' it gave to young children a certain amount of very valuable training of the hand in dexterity of manipulation, and of the eye in the appreciation of form and colour, but nothing beyond—it had no practical application."

We think, perhaps, that when the authors wrote this they were thinking of brush *blobbing*, not brush *drawing;* for the latter cannot be said to lead nowhere, nor to be devoid of practical application—far more so, indeed, than the exercises given in the work before us. Up to a certain point the book is all right, and such examples as are given on Plates 14, 15 (though the venation of the leaves is wrong), 18, 19, and 20 would form useful exercises for junior scholars. Plates 21, 22, 23, and 24 would, however, be beyond such young pupils—that is, if it were expected, as it should be, that accurate *drawing* should precede the colouring.

G. BELL AND SONS.

Cicero: De Senectute. By A. S. Warman, B.A. (Bell's Illustrated Classics.) This is the author set for the next June London Matriculation. The illustrations are good, and the notes simple and clear; there are an index of proper names, particularly necessary in a book so full of allusions as this; an appendix on the uses of the subjunctive, with very numerous examples drawn from the text; and some simple exercises in composition which would very usefully accompany the translation lessons. On the whole, a very useful edition.

Stories from English History: The Hanoverian Period. This is a very fair school history of the Hanoverian period, but the matter contained in it can hardly be called *Stories*. We think the book would have been much better had a considerable number of the somewhat difficult paragraphs been omitted, and some of the leading movements and men been described at greater length.

BURNS AND OATES.

Freehand Drawing of Foliage, etc. By W. J. Carroll. Any work which bears the name of Mr. Carroll is pretty sure to be practical in character, and this is no exception to the rule. It is intended to meet the new requirements for freehand drawing, and is well suited for the purpose. The plants are well chosen, and equally well photographed and reproduced. Mr. Carroll has avoided unnecessary crowding, so that students will have no difficulty in seeing what is to be drawn. Key sketches, showing two stages of the work, are given on each page, and will be very helpful.

CAMBRIDGE UNIVERSITY PRESS.

Prinz Eugen von Savoyen-Sybel. This book is of rather a difficult kind. It is fitted for the advanced student rather than for the schoolboy. Its subject-matter alone requires careful study, and the style and language are none too simple. On this account it has afforded the editor ample opportunities of showing his skill, and certainly he seems to have left nothing undone which can make the study of the book profitable and interesting.

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Geographical Readers of the Continents: Australasia. The publishers of this geography seem intent on keeping up the high standard of their Readers of the Continents, some of which we favourably noticed a short time ago. Good paper and printing, clear and expressive matter, with charming illustrations, are the characteristics of the books. A compact and useful summary is added at the end.

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Experimental Chemistry. By L. C. Newell, Ph.D. Dr. Newell has written a very serviceable book on some easy experiments to accompany the study of the commoner elements, both metallic and non-metallic. There is nothing very new or striking in the course, but the ground is nevertheless well covered with well-chosen typical experiments, whereby the path of the beginner will be cleared of misconception and vagueness.

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THOMAS NELSON AND SONS.

The World and its People: Europe. Among the many geographical readers that are at the present time being issued by publishing firms, this must take one of the foremost places. The style of the reading matter, which is pre-eminently the stamp of any book, is that which appeals to the child-reader most keenly. It is light and free, graceful in its diction, and choice in the manner of setting forth that which must be exceedingly valuable as an adjunct to the geography lesson. Its title is apt. The people of Europe, of whom the book treats with exceptional ability, are, after all, far more important to the child than a knowledge of many of the commonplace details of river, lake, and hill that fill many of the geographical readers of the day. The titles of the chapters, or most of them, are of themselves powerful teachers' aids. They command the readers' interest, and fix in their minds exactly what they *ought* to know. "A Little Tour in Switzerland," "The Playground of Europe," "The Eternal City," "The Spaniards at Play," "Father Rhine," "Mother Volga," and "The Czar's Window" are examples. The first of these chapters is in letter form, written in as simple a way as possible, without being too easy for the average child of Standard V. Special reference to the admirably-conceived sea voyages must not be omitted. In these the child is taken from place to place, and interested in what belongs to the commercial prosperity of the continent to which he is by birth and home attached. The lesson on "The Gay City" is a masterpiece of sympathetic and telling description. Indeed, all the chapters reach a high level of literary merit, and serve as models to be imitated in the composition lesson. The illustrations, which abound in the book, being beautifully reproduced from photographs, are real and impressive, while the maps and coloured plates are beyond all praise. There are in all fourteen coloured illustrations, and these show sixty-two views of importance. An excellent summary completes the book.

NORMAL CORRESPONDENCE COLLEGE.

Text-Book of Political Economy. By E. C. Robinson, M.A., LL.B. This is a very good manual on a somewhat difficult subject. The author has succeeded in making clear many of the puzzling problems which confront the beginner. The questions and notes are very helpful. The book deserves a very much better "get-up" than it has received.

History of Europe, 1814 to 1848. By M. K. A. Beisiegel. The first essential in a history is, we take it, accuracy; and the second, clearness, ease, and elegance of style. In neither of these points is the book before us at all satisfactory. It contains a vast number of facts more or less correct, but badly arranged and awkwardly expressed. The writer seems unable to appreciate the relative value and true perspective of events, and effectually obscures the great political movements by a host of trivial details. The perusal of the book gives rise to undisguised weariness. If two-thirds of the facts were deleted, and the remainder clad in passable English, the book would be immensely improved.

GEORGE PHILIP AND SON.

Geographical Summary. By G. Webb. This book contains a host of facts in geography, useful perhaps for the advanced

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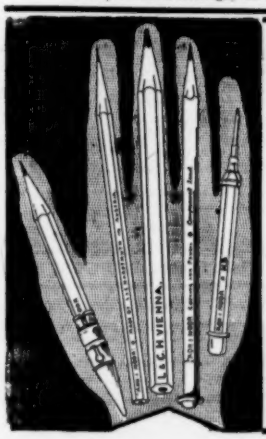

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